# IRON & COAL
TRADES REVIEW

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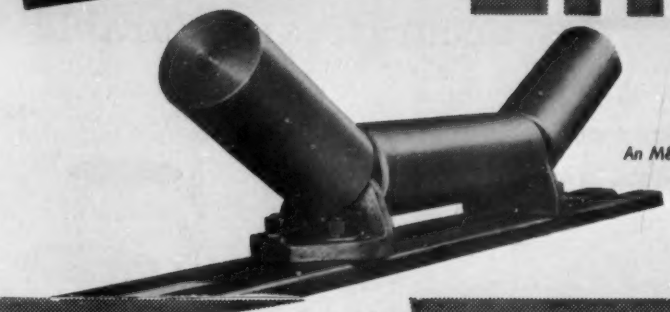

An M&C idler for a 30-in. conveyor belt.

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*EXAMPLE WITHOUT MAINTENANCE*

*1950, the belt conveyor idlers sealed for their first life. By arrangement, the grease gun was not used. 1959, still going strong.*

*EXAMPLE WITH MAINTENANCE*

*1943, sealed for first life. Three-shift running. Resealed by grease gun at intervals. 1959, aged 16 years, still going strong. All the original spare rollers are still in store.*

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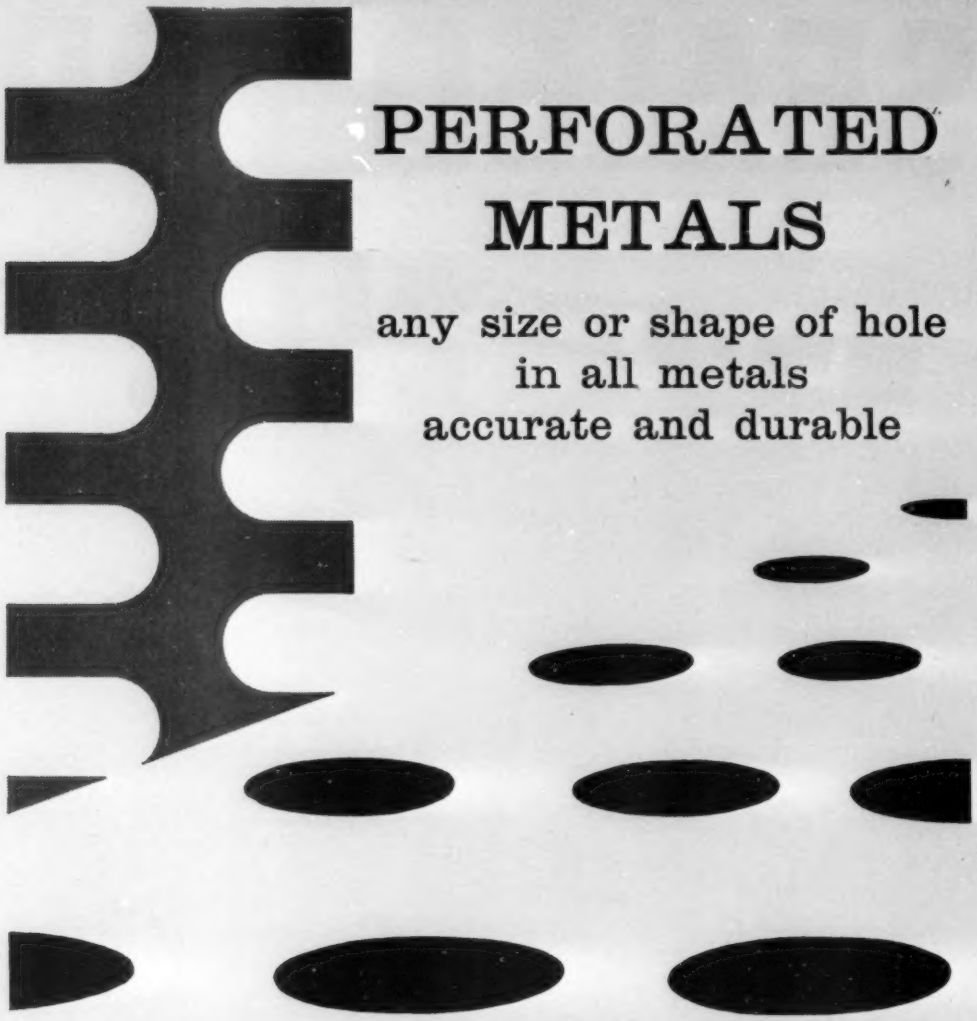

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*Simon-Carves Ltd have produced a new brochure, Steelmaking and Electro-Precipitation, for those with gas cleaning and dust collection problems. To obtain a copy, write to CPP Division (ICTR) at the address below.*

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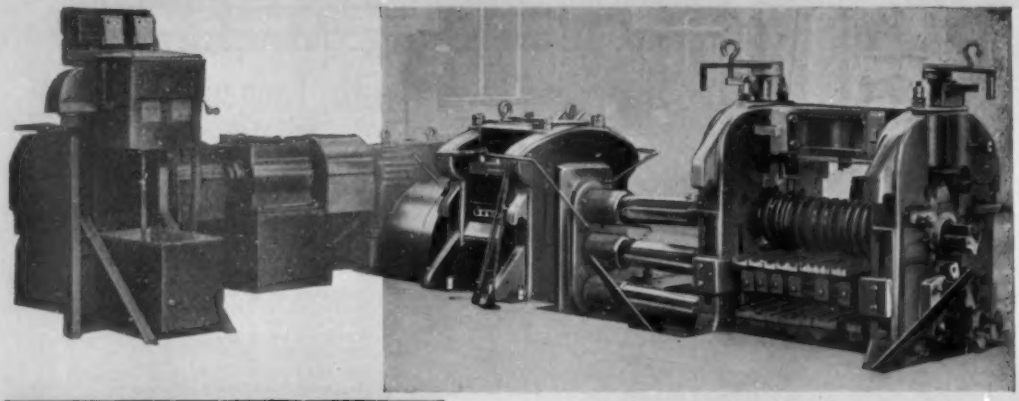

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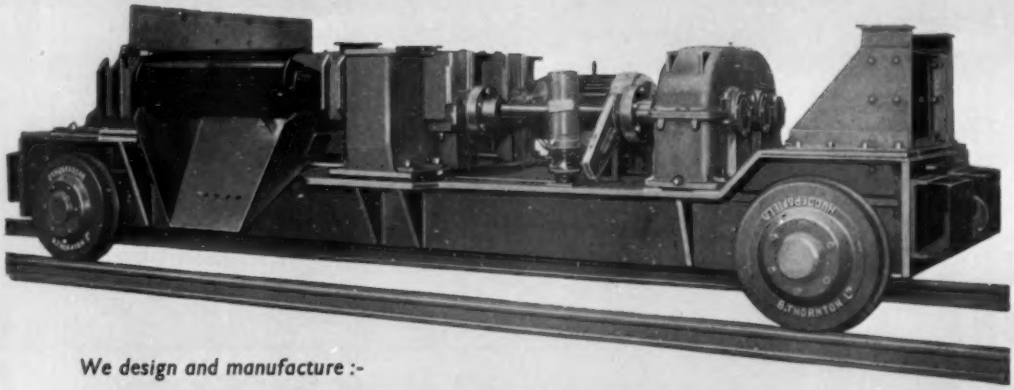
## Engineers and Contractors

*12" Mill as supplied to Swinden Laboratories Rotherham, and published by courtesy of The United Steel Companies Ltd.*

*Ingot Transfer Car for conveying 4/5 ton Ingots.*



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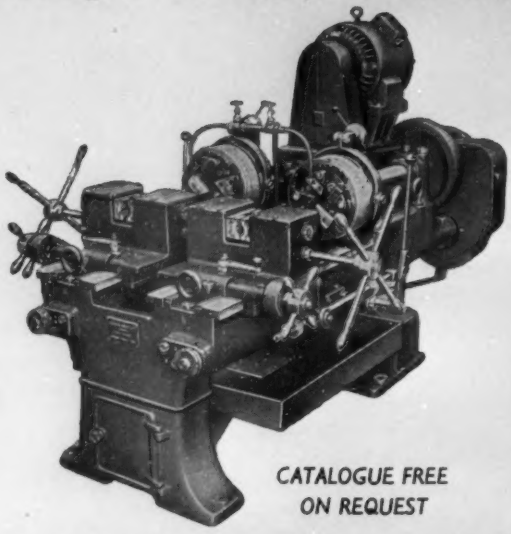

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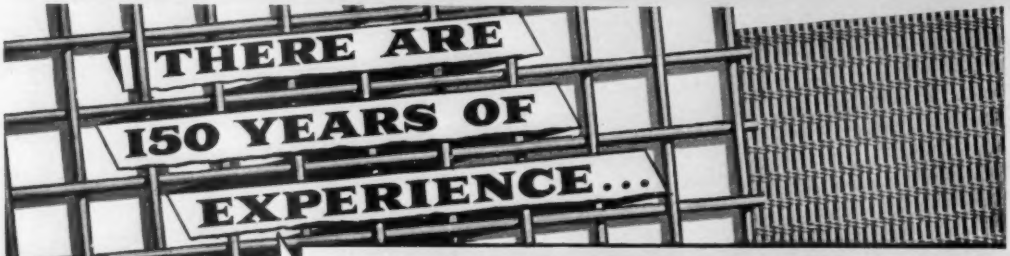


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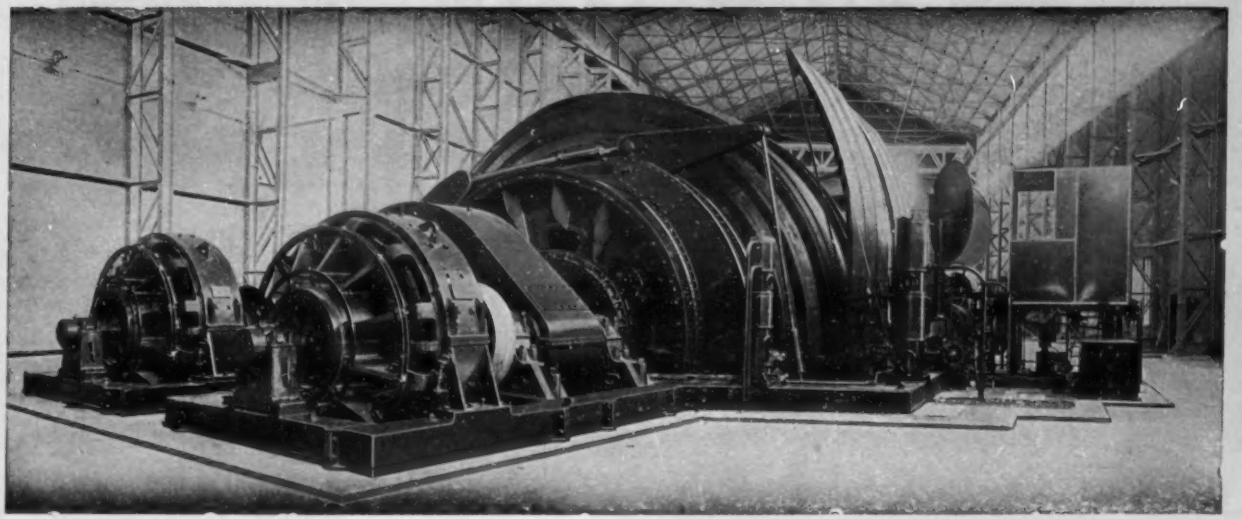

Gear Driven Double Central Drum Electric Winder. Drums 13/30ft. dia. Depth of wind 5,200ft. Vertical. This large Winder was one of two recently installed in South Africa.

*Illustrated Catalogues will be sent on request*

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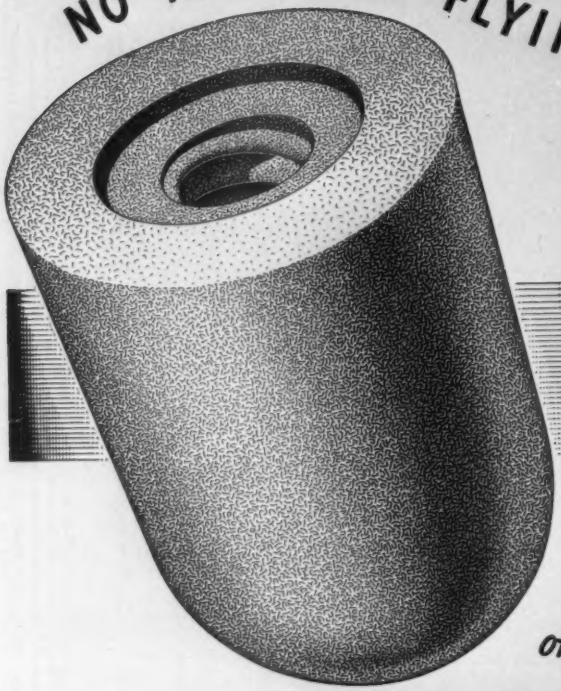

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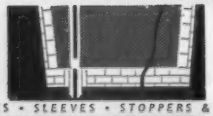
**"SR" is highly refractory, accurately shaped —and tough. Consistently better and *COSTS NO MORE.***



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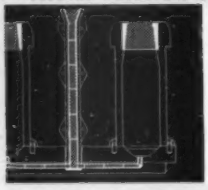

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*Modern carving*
*of a sow and litter*
*in All Saints Church, Beighton.*
*Photograph by Ruth Meyler & F. C. Sillar*

# 50 MILLION PIGS GO TO MARKET!

In the early days of the industrial revolution manufacturers frequently looked for familiar and easily recognisable descriptions of their products. To the countryman transplanted into industrial surroundings nothing was more familiar than a pig; a fact which is emphasised by carvings in scores of old churches depicting pigs suckling their litter, rooting for acorns and playing the bagpipes. Apparently this last pastime was forsworn by pigs many years ago because of unpleasant associations between bagpipes and pigs bladders.) Consequently, when iron from Blast Furnaces was directed into long troughs and from there into short and narrow troughs placed at right angles, a resemblance to sows suckling their appendaged litter led to the description of 'pig iron'.

This series of advertisements illustrates some of the 'ecclesiastical' pigs and emphasises the 50,000,000 'special' pigs which Warner and Company have supplied to Iron Foundries producing High Duty Castings.

WARNER WARNER WARNER

"Pioneers of Refined Pig Iron"

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**wt. 27 lbs.**
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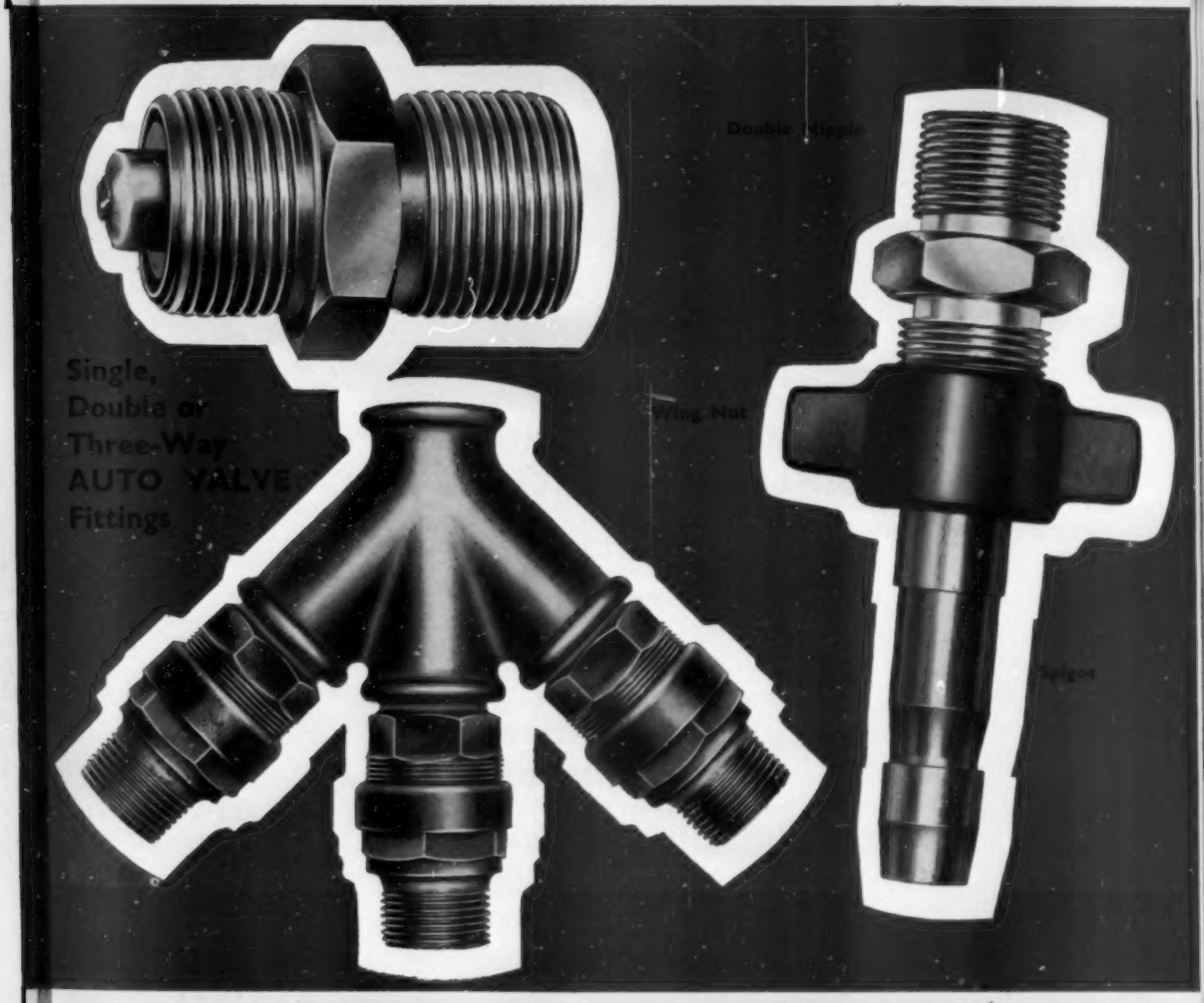


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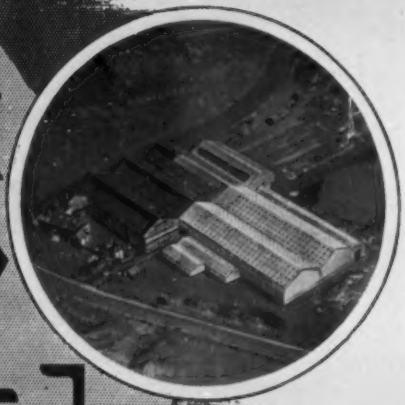

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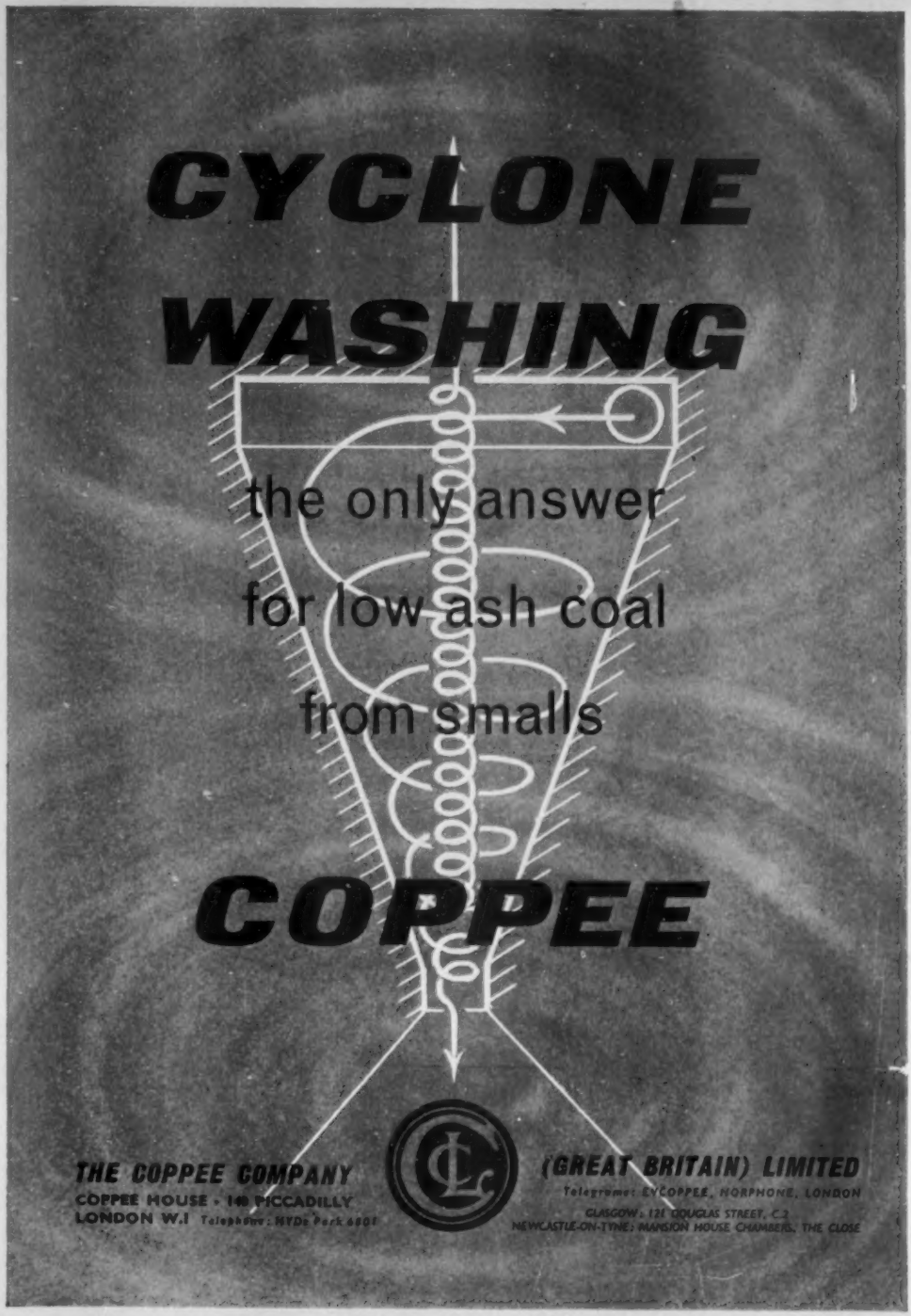
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# Britain's new steelmaking processes set challenge to steelmen

**The next ten years will be decisive for the future of Britain's steel industry. New methods are being developed which will change the established pattern of steelmaking. It is an exciting–and challenging–time.**

The big new factor is oxygen. Ordinary oxygen from the air we breathe, but used as a pure gas, *by the ton*. In making steel it removes impurities more quickly and more cheaply than has ever been possible before.

New oxygen-making plant is being set up alongside the major steel works to deliver the gas along pipelines. About 3,000 tons of oxygen a day will soon be available.

## Output: a 100% boost

Dr. Colclough, technical adviser to the British Iron and Steel Federation, has been a crusader for oxygen for 20 years. The great change that is making his vision practicable is that oxygen by the ton ("tonnage oxygen") is now available at a reasonable price.

FEDERATION'S COLCLOUGH
Crusader for oxygen

Dr. Colclough believes that, in Britain, oxygen can be used with greatest effect in the open hearth process, by which 85% of our steel is made. He says, "There is no question but that in the next ten years we shall see a revolution in open hearth steelmaking." Already, at the Appleby-Frodingham works in Lincolnshire, the open hearth furnaces converted to the Ajax process, using oxygen, have achieved outputs of up to 100% above those of conventional furnaces.

"The industry has gone a long way to solving the problems of using tonnage oxygen," says Dr. Colclough, "and many major steel developments of the future will be based on this principle. And by equipping the new oxygen-using plants with dust and smoke eliminators we are reducing the amount of air pollution caused by steelmaking."

## New furnace, new methods

Another enthusiast for oxygen – though using it in quite a different way – is Mr. Emrys Davies, Works Director of Brymbo Steelworks in North Wales, which pioneered the large-scale use of oxygen.

At Brymbo, after the war, they had a blast-furnace (for making iron) and some old open-hearth furnaces (for turning the iron into steel). They were also making high-quality steels in electric arc-furnaces, mainly from scrap – because iron from a blast-furnace is much too impure to put into an arc-furnace.

BRYMBO'S DAVIES
Steel at the cross-roads

They wanted to go over entirely to electric steelmaking. But it looked as though this would mean that they couldn't use the iron from their blast-furnace at all. Mr. Davies and his team developed an oxygen-blown furnace of wholly new design, to pre-refine blast-furnace iron before it went to the electric arc-furnaces.

Here are the makings of another revolution – because electric steelmakers have been chiefly dependent on supplies of scrap. Reducing this dependence could be very important – so much so that steelmakers as far afield as Japan are extremely interested in what is going on at Brymbo.

## Less power, more steel

This completely new process has been embodied, daringly, in a £2 million development scheme, now proving its worth in full production. It has cut the time taken for the arc-furnaces to refine a charge of metal. It has reduced the electric power needed to refine a ton of steel from 650 units to 400 (quite important, when you consider that the Brymbo melting shop uses 10 times as much power as the whole of the nearby town of Wrexham). Outputs are up

*Molten metal pours from the new Brymbo furnace, pre-refined with oxygen. This is one of the new developments which are bringing a revolution in steelmaking.*

*at least* 25% – "a very conservative figure," according to Mr. Davies.

And whereas a Bessemer converter needs re-lining with special bricks after being used 80 to 100 times, the Brymbo pre-refining furnace has already been used 1,000 times. It has produced 25,000 tons of steel and will probably produce 10,000 more before re-lining is needed.

Most important of all, perhaps, the Brymbo process has signposted one possible way ahead for the whole industry: pre-refining can be applied just as successfully to open-hearth working. "Steel is at a cross-roads," says Mr. Davies. "The next decade of steelmaking will probably be the most interesting for 100 years. Great developments are taking place."

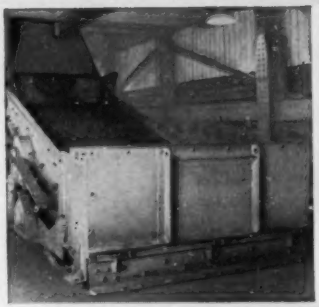
Oxygen is coming into its own, taking its place alongside iron ore, coke, and lime-stone, as a basic raw material in steelmaking. Already Britain's steel men can see that it brings higher output and lower costs. It will mean an all-round improvement of efficiency in Britain's already highly efficient steel industry.

*This report on progress in oxygen steelmaking forms part of the "Autumn report to the Nation" published in the press by the British Iron and Steel Federation.*

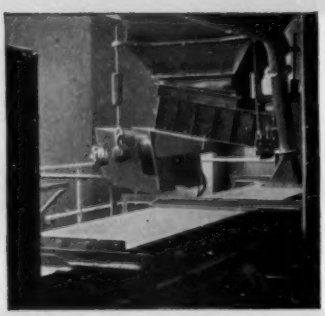
# feeding and screening

1860 F&C 1960

Sherwen screen handling limestone



Gyrex screen sizing coke



Sherwen feeder handling slag

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THE GENERAL ELECTRIC COMPANY LIMITED OF ENGLAND
FRASER & CHALMERS ENGINEERING WORKS, ERITH, KENT

rely on the experience of G.E.C.

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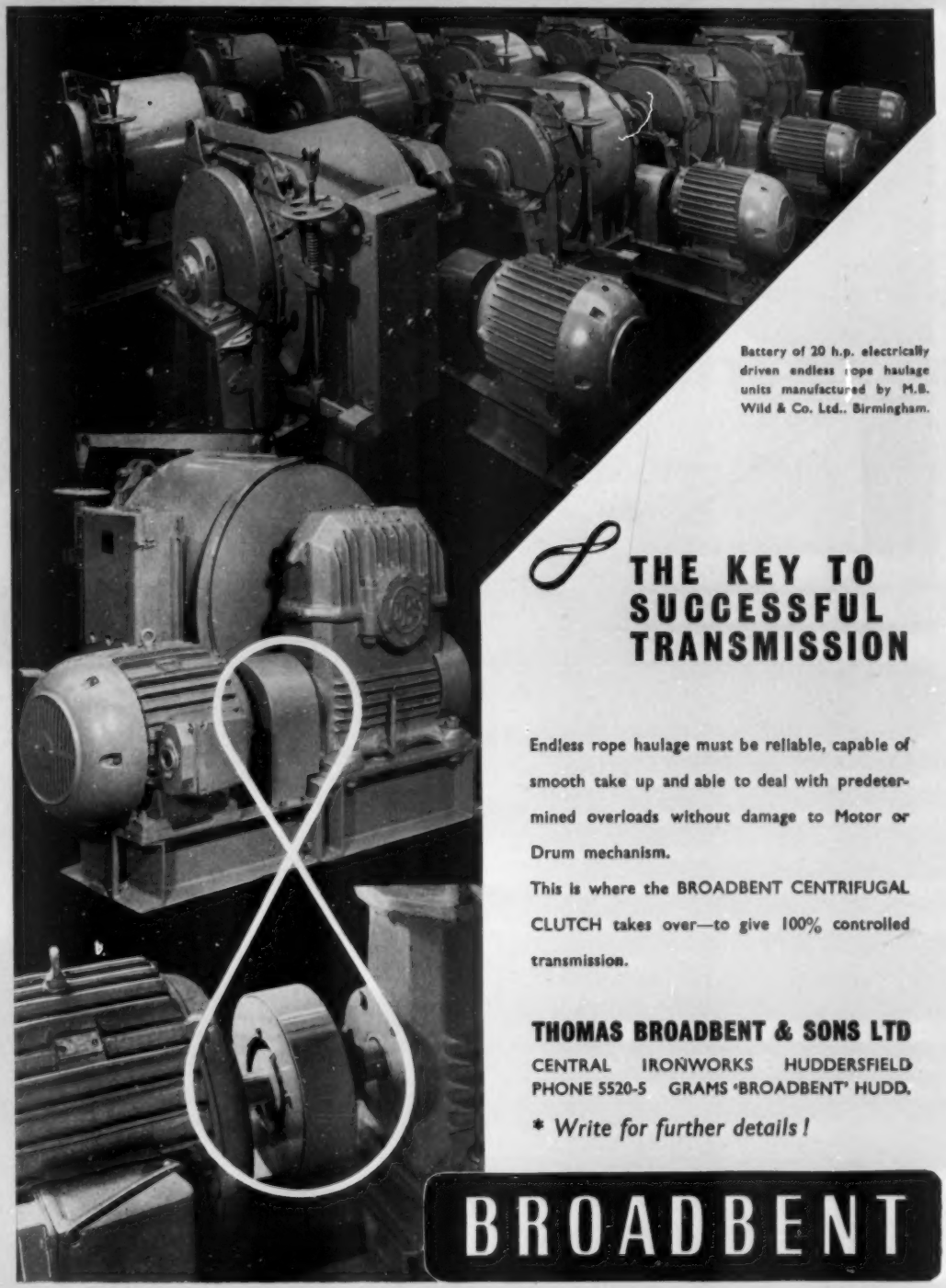

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# THE KEY TO SUCCESSFUL TRANSMISSION

Endless rope haulage must be reliable, capable of smooth take up and able to deal with predetermined overloads without damage to Motor or Drum mechanism.

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PHONE 5520-5 GRAMS 'BROADBENT' HUDD.

* *Write for further details!*

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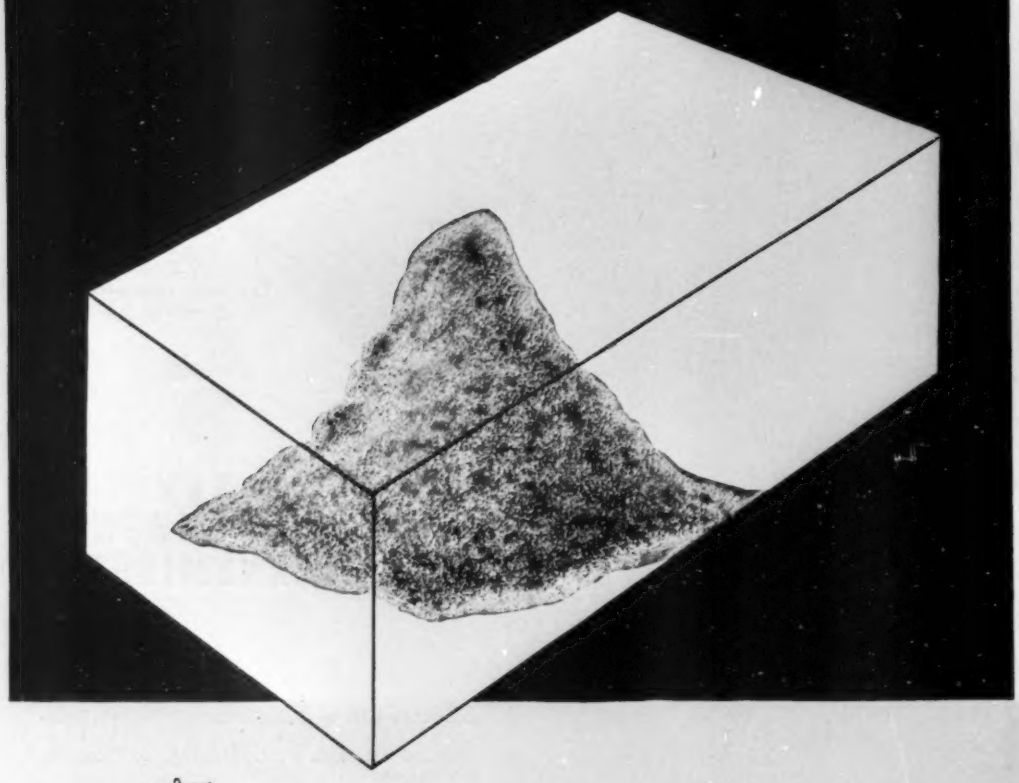

As well as making top quality sand lime, concrete and refractory bricks, the Sutcliffe, Speakman EMPEROR Press makes bricks from clinker, burnt shale, slag, etc. – once considered useless waste. They're good quality bricks, consistent and always well formed.
The EMPEROR Press comes in various sizes – the Duplex exerts a pressure of 200 tons and can make 3,000 bricks an hour, operating round the clock. Sutcliffe, Speakman are specialists in this type of work. They supply a complete range of plant and equipment, and can undertake the erection of complete brickworks and hand them over in working order.
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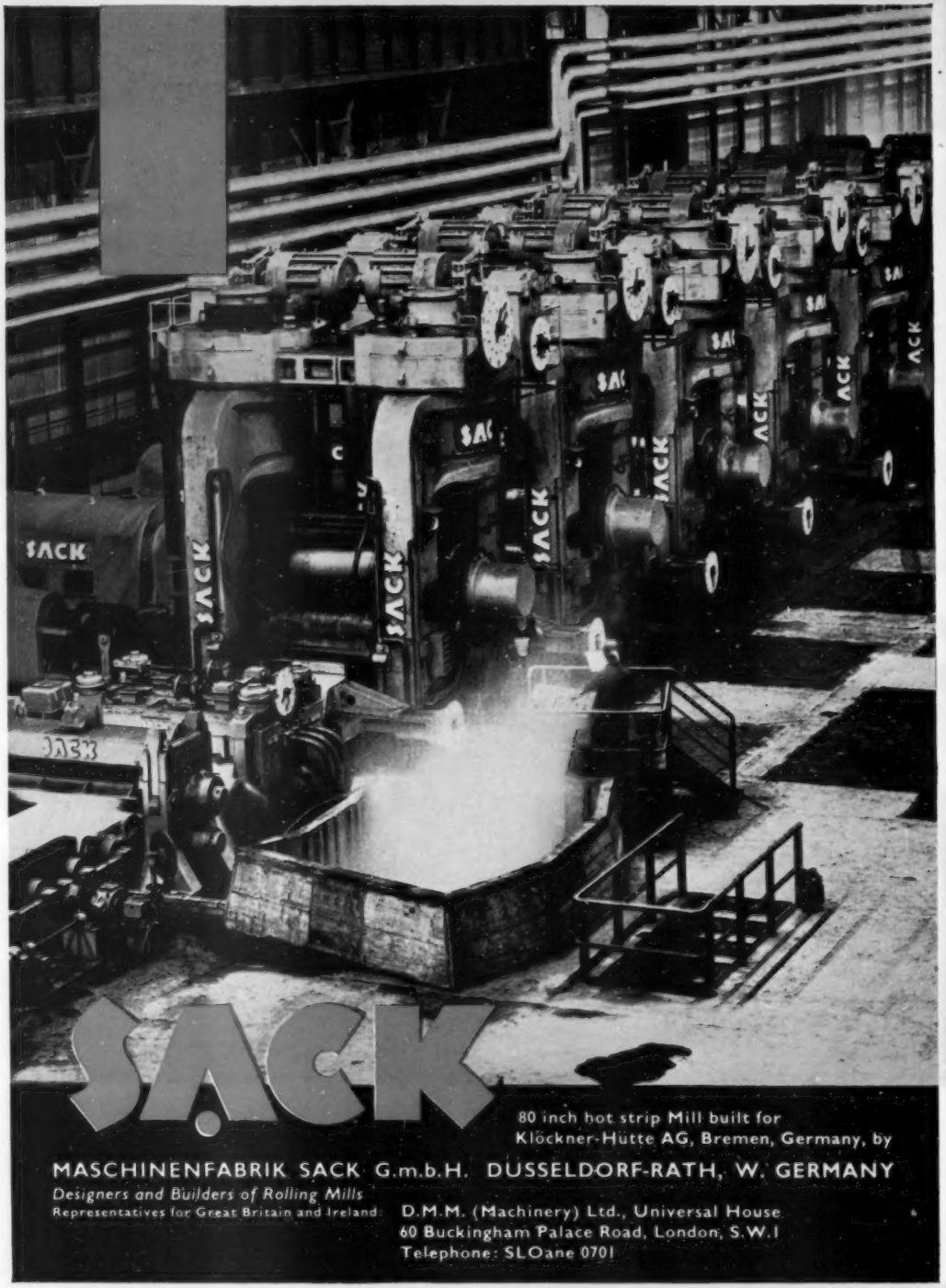
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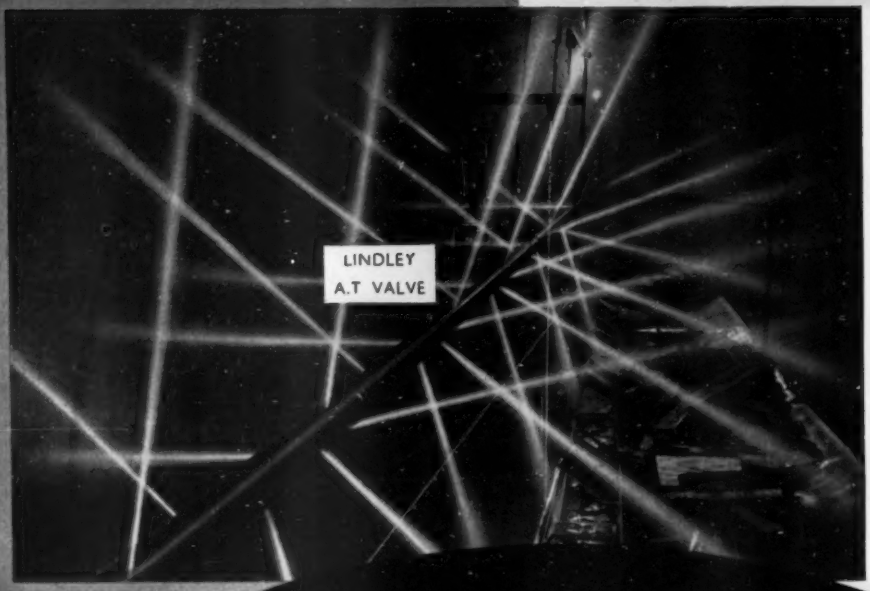


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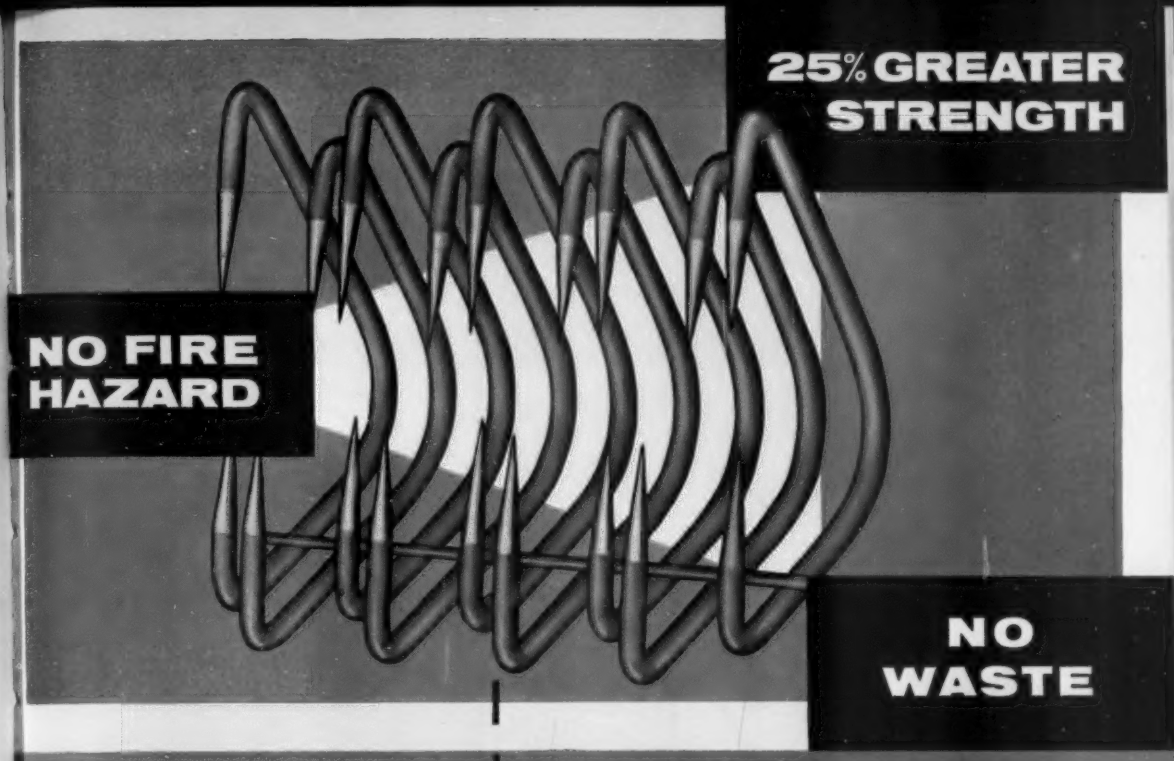


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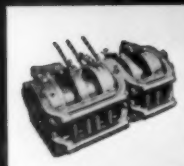
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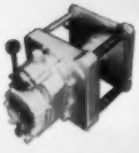
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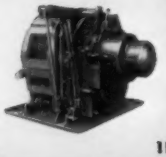
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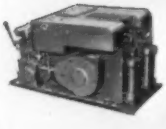
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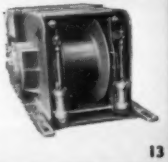
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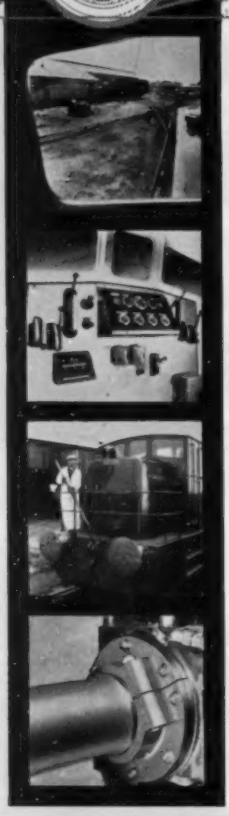
# LSSH

## new Ruston diesel-hydraulic shunter

Every carefully planned inch of the new 'LSSH' shows the advanced thinking and wealth of experience that go into locomotive design at Ruston. These 32 and 34-ton machines with Twin Disc torque converters and Paxman 275 b.h.p. diesels have a combination of advanced features and common-sense engineering that will make works haulage faster, safer and more economical than ever before.



**Maximum all-round visibility from spacious cab.**

**Three lever control** for easier driving and more precise shunting. Double-blown sanding gear ensures efficient sanding in all conditions.

**Walkover platform** at rear of locomotive. Another shunter's platform is inset within the frame at the front.

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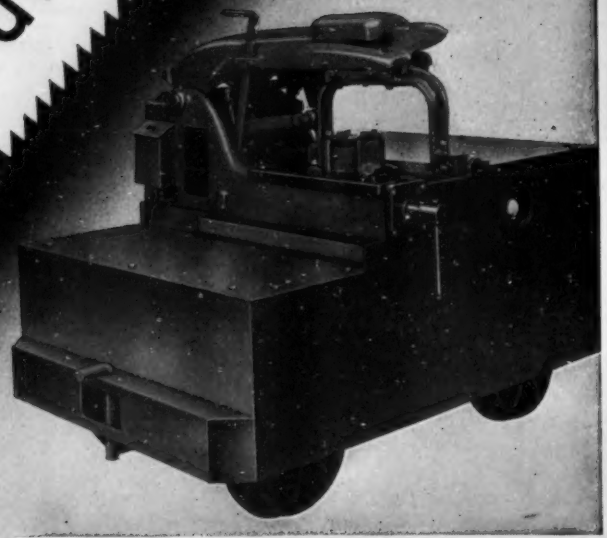

A mobile unit powered by compressed air or electric motor for sawing steel underground with safety and speed.

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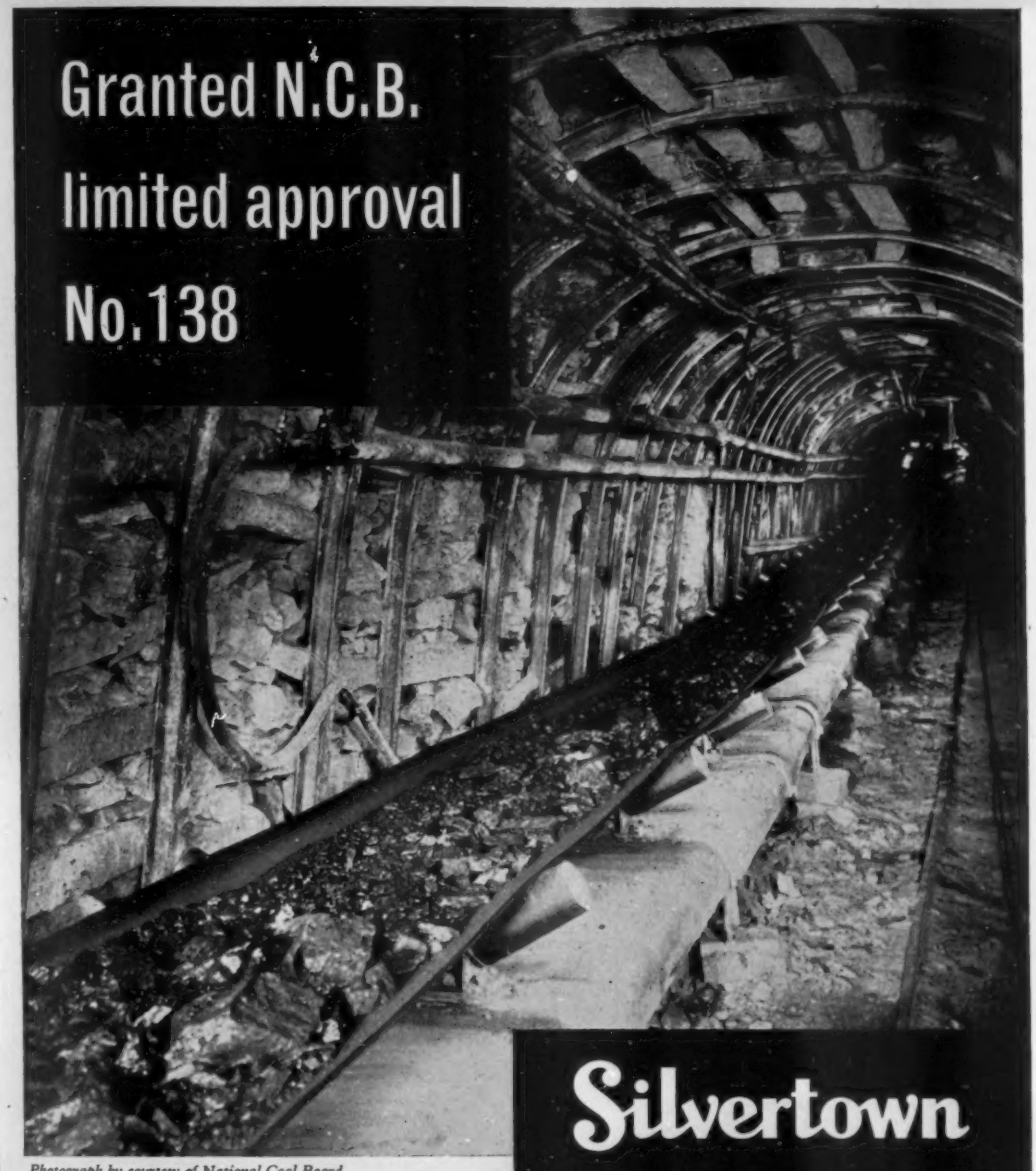

*Photograph by courtesy of National Coal Board*

Silvertown PVC nylon-wefted conveyor belting has been granted N.C.B. Limited Approval No. 138. This belting, shown here in service at the Harry Stokes Drift Colliery, Bristol, has a performance far superior to heavier constructions employing the highest quality cotton duck, ensuring increased economies wherever it is installed.

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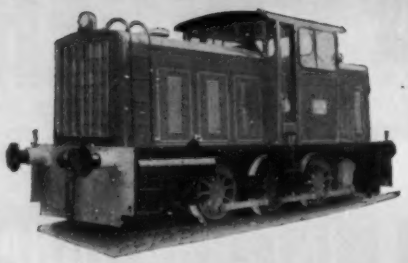

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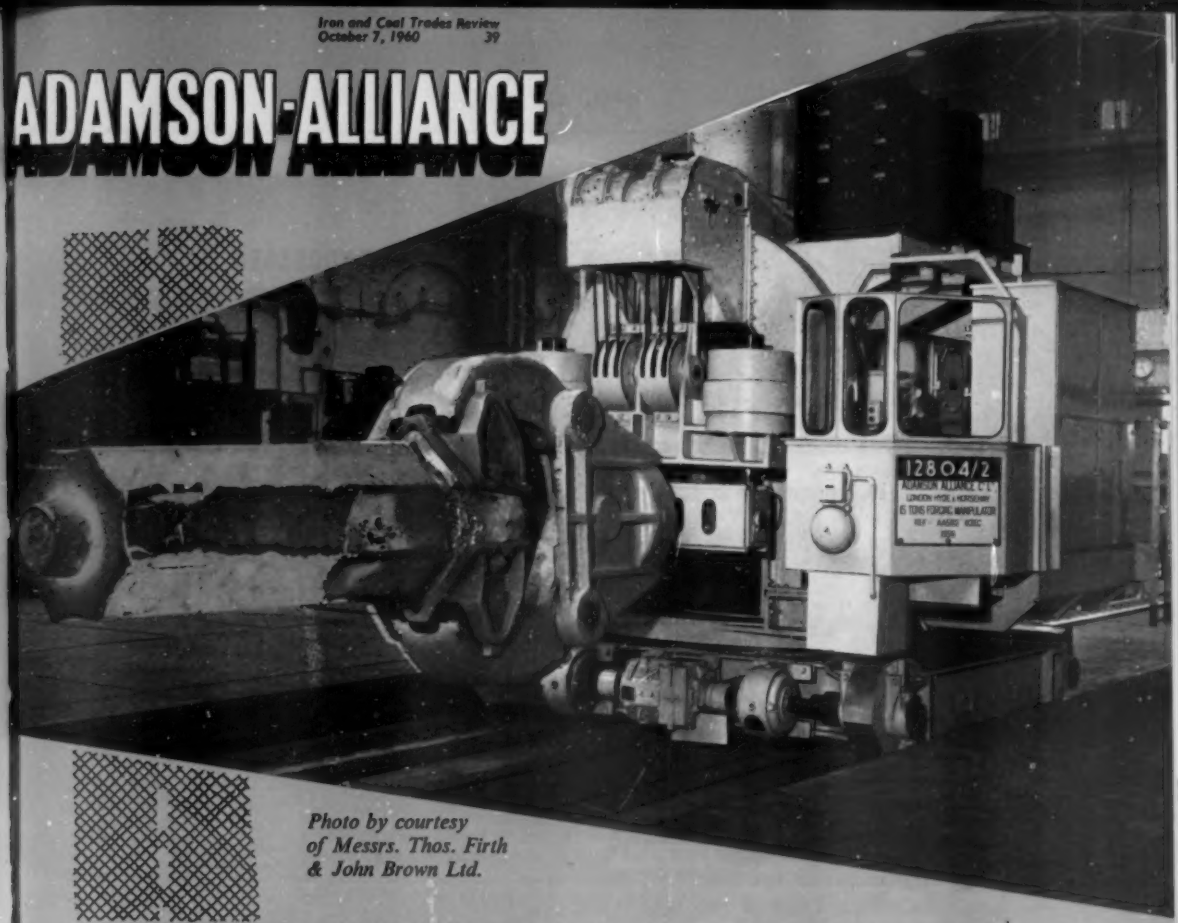


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Ferroclad bricks are steel-clad on four sides, and have the following advantages over the traditional fired bricks:—

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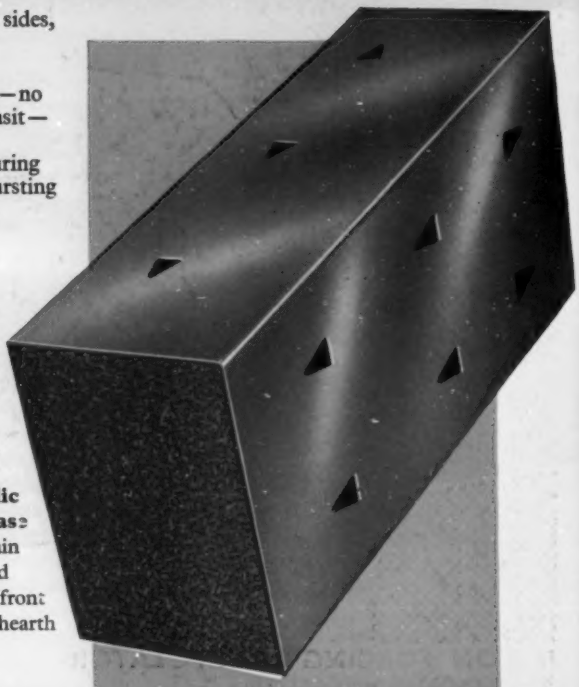

COVERED BY BRITISH PATENT Nos. 546, 220

For over 10 years General Refractories Ltd. have manufactured steel-clad basic bricks under licence by the Heuer processes. **One of the principal features of Ferroclad is that the graded refractory material and metal casing form an integral unit by means of controlled hydraulic pressure—no air infiltration—the case fits like a glove.** It is made in four main qualities to suit requirements. Ferroclad bricks are extensively used in the roof, front and back walls, and ends of basic open hearth furnaces; in basic electric furnaces; and in copper reverberatory furnaces.

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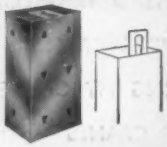
Divided internally by two plates placed lengthwise. This system reduces flaking and spalling to a minimum and can be applied to all Ferroclad shapes and sizes.

Covered by BRITISH PATENT Nos. 546, 220., 778, 047., and 778, 048

### TABHANGER SUSPENSION



Bricks supplied with a special stainless steel tab co-moulded with the brick, embedded into the surface of the top face. By the use of a special tool the tab may be bent out at right angles to the top face to form a hanger.

Covered by BRITISH PATENT Nos. 546, 220 and 749, 491

### FERROCLIP SUSPENSION

This method allows the brick to be suspended from the end. The Ferroclip hanger slot may be moulded into any roof or wall shape.

Covered by BRITISH PATENT Nos. 546, 220 and 600, 630

*During recent years the demand for Ferroclad has increased so tremendously, that General Refractories Ltd. have granted a sub-licence to Messrs. Pickford Holland & Co. Ltd. to manufacture similar products within the scope of the British Patents mentioned above.*

**The basic process of metal-cased brick manufacture is covered by British Patent No. 546,220 and other additions, including the "Ferroclip", the "Tabhanger" and the "EE", are covered by British Patent Nos. 546,220, 600,630, 749,491, 778,047 and 778,048.**

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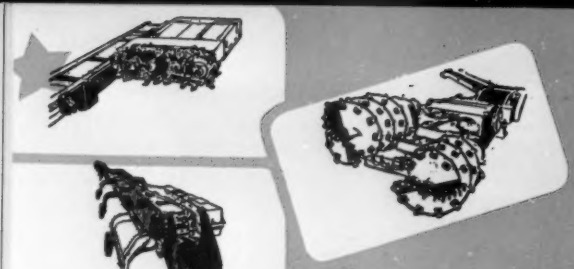

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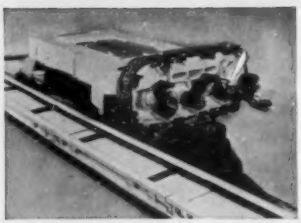
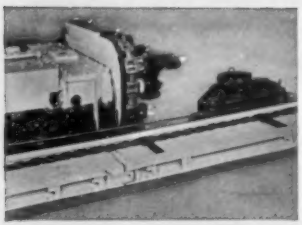
# CRAWLEY MIDGET MINER

**A low seam wide buttock loader for seams of 18in.—30in.**

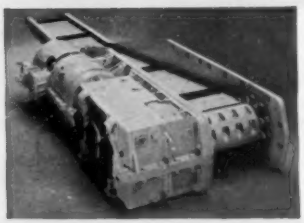
The machine as illustrated is single ended and has four boring arms spaced at approximately 72° lag to each other. These operate ahead of the periphery chain which clears any uncut and unloaded coal. The chain includes flight pick boxes specially designed to ensure complete loading of coal.



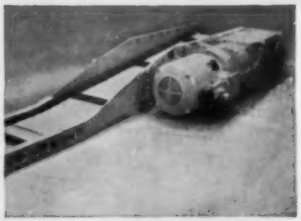
An efficient water jet dust suppression system is an integral feature of the machine.



Outputs equivalent to 200 tons/shift in seam height of 2ft. 6in. have been achieved, with considerable improvement in output per man shift.



*The illustrations on either side show the C5 Lo-hite conveyor currently in use with the Midget Miner*



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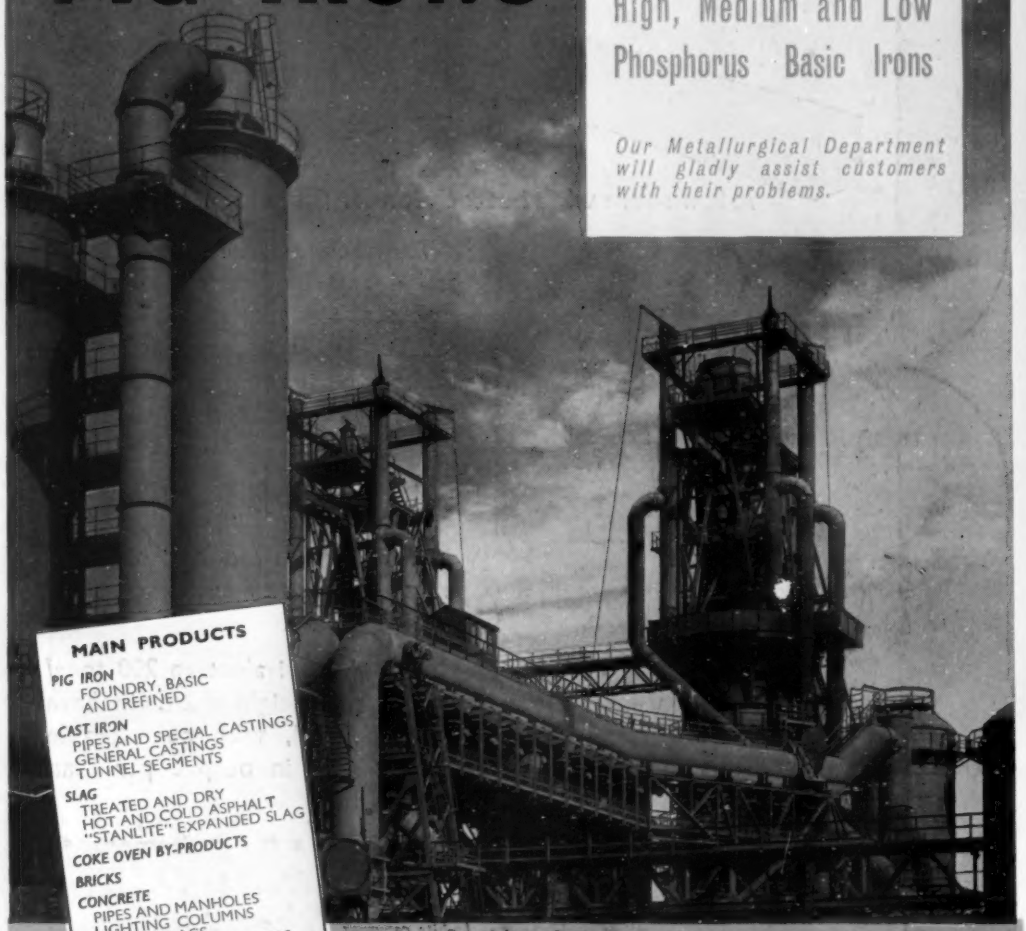

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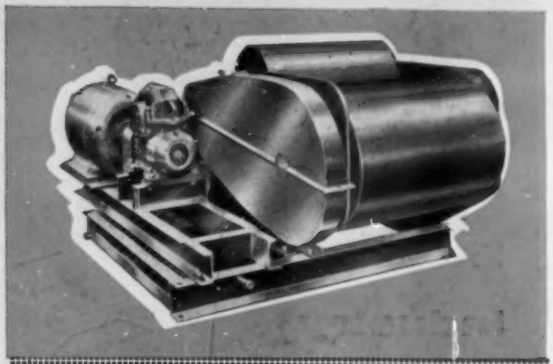

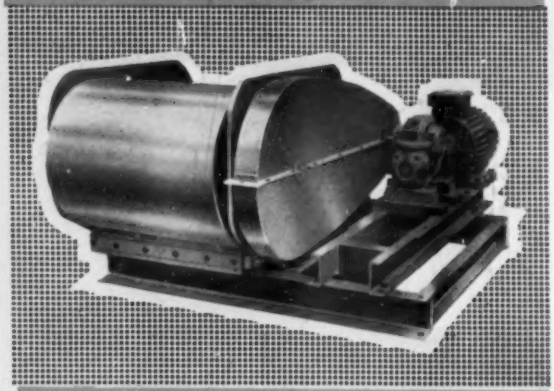

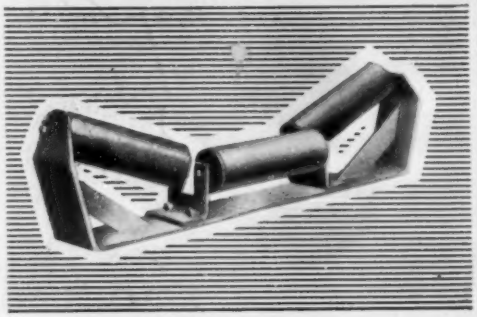

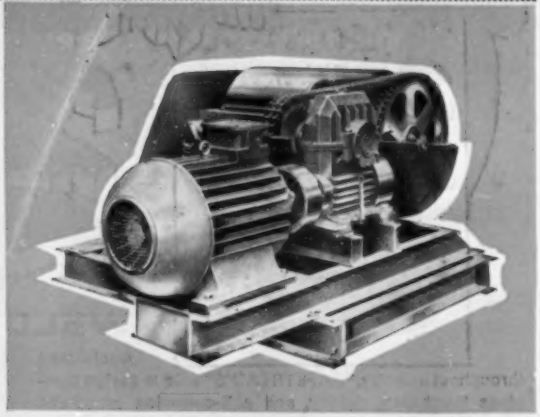

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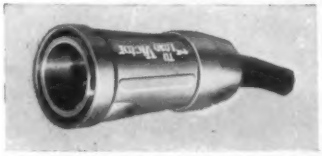

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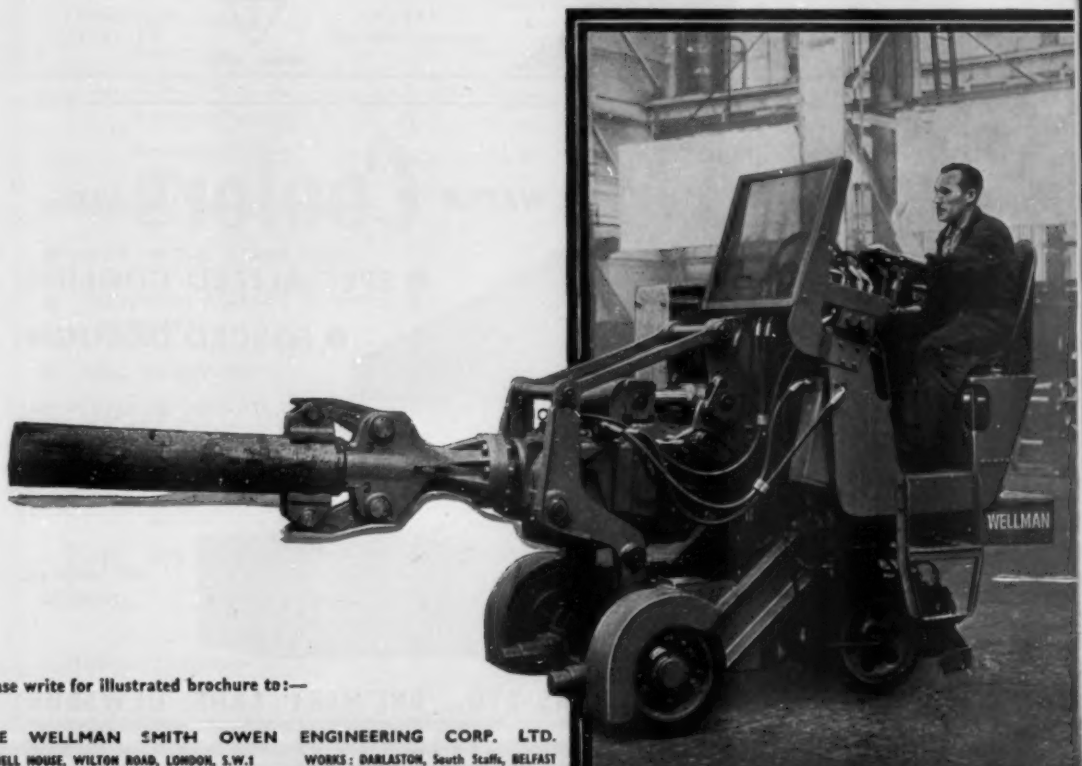


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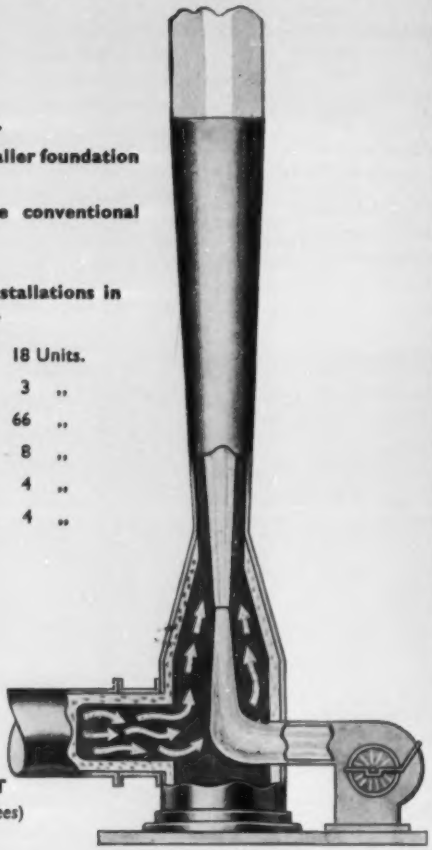

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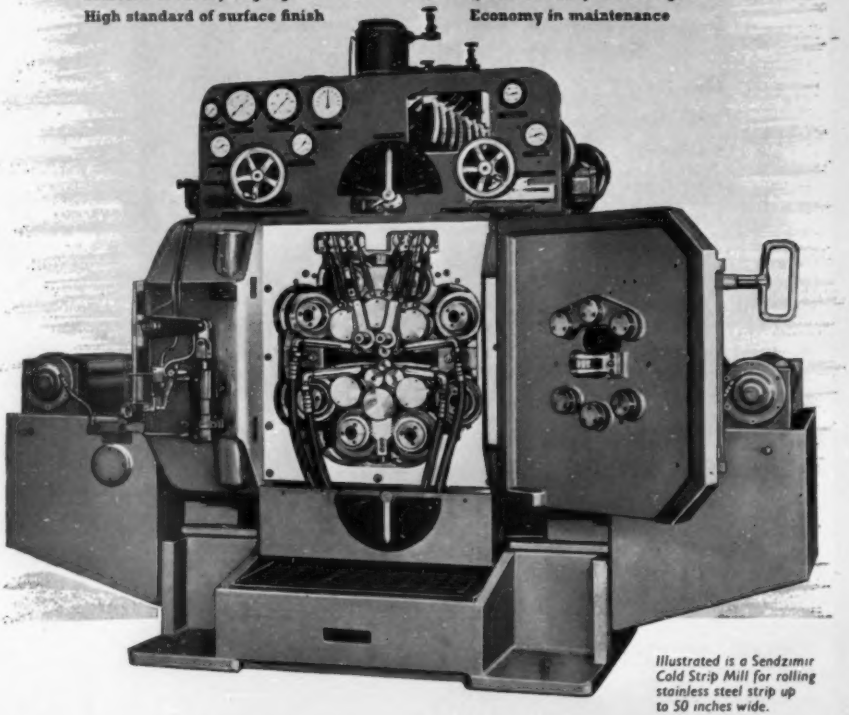

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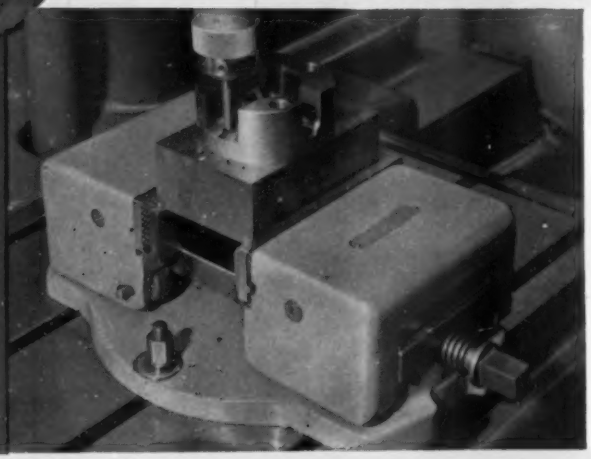

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OCTOBER 7
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Vol. 181
No. 4,812

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IRON AND COAL
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Vol. 181 October 7, 1960 No. 4,812

# *Continuous Casting Accepted*

SPECIAL significance for the steel industry attaches to the paper, "The Continuous Casting of Steel," presented by Mr. J. Savage at the recent meeting of the British Association for the Advancement of Science, for this paper can fairly be interpreted as the acceptance of continuous casting as a practical and commercially viable process. Mr. Savage, using the British Association forum, told the layman that in recent years—since the end of the second world war, in fact—the combined efforts of steelmakers, engineers, and laboratory scientists had made possible a revolution in steel production—the so-called continuous casting of liquid steel direct into a form suitable for the final stages of rolling to finished product.

This is real news to the layman, and offers timely encouragement to those in the steel industry who are treading a pioneer path in this new process. For it must be emphasized that steelmakers in this country have long shown an enlightened attitude towards the development of a means of continuously casting steel. Thus, when the steel industry set up its central research organization—BISRA—just after the war, the continuous casting of steel was immediately listed as a research project. It is therefore not surprising (though it is nevertheless gratifying) that the British iron and steel industry now stands to the fore in the commercial application of this process.

The idea of continuously casting metals is not of recent birth, one device for this purpose having been patented by Sir Henry Bessemer more than 80 years ago. However, the obstacles standing in the way of regular operation of a continuous casting plant were truly formidable until the measurement of the high temperatures of molten metals became practical. Thus, the continuous casting of non-ferrous metals of relatively low melting point did not become a commercial proposition until the fourth decade of this century. For steel, with its high melting point, the outlook in 1946 when BISRA began its researches was not encouraging. Attempts to cast steel continuously were on record, but these had produced a great deal of scrap metal and only a small proportion of bar, the internal and external quality of which was not good. Indeed, many experienced steelmakers felt that continuous casting would remain a wild dream as far as steel was concerned. Others took up the challenge in earnest. Enthusiastic workers in this country, on the Continent, and in America began to report and exchange experiences. First, small pilot plants were operated; then larger semi-experimental, semi-commercial plants came into being in a number of countries. Russia—with what is now accepted as her characteristic boldness in research—made gigantic efforts and achieved great success. Britain's efforts, though far less spectacular, have been no less rewarding.

Today, Britain's plans for the continuous casting of steel are as ambitious as those of Russia. As the audience at Cardiff was informed, the Steel Company of Wales, Limited, is installing the first commercial machine in the world for slab production by continuous casting of Bessemer steel. The company announced this in February. In April, the United Steel Companies, Limited, announced that a 50,000-tons-a-year continuous casting plant was to be installed at its Appleby-Frodingham works. In August came another continuous casting announcement, informing us that Richard Thomas & Baldwins, Limited, is to have a continuous casting plant for slabs in stainless and other qualities of steel.

These companies are taking bold steps. They are putting into effect the conscious belief of the metallurgists, engineers, and operatives of the industry that continuous casting of steel is both practicable and profitable. They know that, like all new plants, these continuous casting plants will have their teething troubles, perhaps more than is usual, because it is a case of a new plant and a new process. But—and this is the significance that should be attached to the announcement at the British Association meeting—we have now accepted psychologically that the process can work, just as, early in this century, we accepted that heavier-than-air machines could fly. Any difficulties that arise at these new plants will be regarded as a challenge by the engineers and the metallurgists concerned, and will be dealt with accordingly.

The companies named are facing up to the fact that the process is vital to them if they are to retain and expand their export markets, for continuous casting gives at least a 7 per cent. reduction in production costs. Our competitors in world markets are also fully alive to the commercial potentialities of continuous casting plants, and Russia—the greatest protagonist of continuous casting—is now approaching the stage when she can spare some steel for export.

Seen in this light, the 1960 announcements about continuous casting plant must surely rank as the steel news of the year.

# *Passing Thoughts . . .*

IN general we all believe in clean air, just as we all believe in lower taxes and lower rates but higher benefits from the State and from local authorities. We can have clean air at a price, but is it a price that many people are willing to pay? The county in which we are met has an old-fashioned maxim. . . . "Where there's muck there's money." So the National Society for Clean Air will have to work hard to convert some of our people. It will only succeed if it convinces them that clean air pays."— SIR LINTON ANDREWS, editor of the Yorkshire Post, giving the Des Voeux Memorial Lecture at the National Society for Clean Air Conference at Harrogate yesterday (Thursday).

*The increase in the price of coal is a direct result of the burden placed upon the industry by the Government's dear money policy. To blame it upon wage increases is a distortion of the facts.—Letter in the Daily Telegraph.*

Coal has real advantages, which the industry is already successfully bringing home to industrialists. But is it as cheap as it could be? Answers need to be found to a whole number of questions in connection with Britain's fuel and power needs. It would be good to think that someone or somebody was *seriously* engaged in looking for them.—Birmingham Post.

*It has not been Tory Government policy to force up costs in the mining industry, by forcing uneconomic rises in the cost of coal—that has been deliberately the policy of men like Mr. Paynter.—Letter to the Guardian-Journal, Nottingham.*

The Government must realize that exhortations will never provide that enthusiasm and drive for foreign trade which is essential for our national well-being. Exports are subject to far greater risk than home trade and some encouragement of a fiscal nature must be provided so that a greater amount of the profit earned on export business can be utilized as a reserve against losses which are necessarily incurred in promoting new markets.—MR. JOHN V. SHEFFIELD, chairman of Horseley Bridge & Thomas Piggott, Limited, constructional engineers, ironfounders, etc., of Tipton (Staffs).

*There is little doubt that if it were to spend more money on export promotion, and spend it imaginatively, the Government could achieve more in the way of increasing exports than it ever can by exhortation.—Financial Times.*

In order to live we in Britain must sell abroad 30 per cent. of all we produce, and since no one can compel the foreigner to "buy British" if other makes are cheaper or better, can no one knock into the heads of our people that by limiting production and demanding more and more for less and less, they are committing industrial suicide.—MR. CYRIL OSBORNE, Conservative MP for Louth in a letter to the Daily Telegraph.

*It has been decided that the code name for the major expansion scheme, involving all aspects, now being started on the works, will be TEMPER. This code name will stand for "Twenty Eight Million Pounds Extension for Rods."—App-Frod Record, works newspaper of the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited.*

# More Research Needed by British Industry

UNLESS British industry takes a greater share of responsibility for civil scientific research "there is little prospect of a real solution of the development problem and our competitiveness as an industrial power will be in jeopardy." This is one of the conclusions given in the annual report of the Advisory Council on Scientific Policy, published on Tuesday.

Total UK expenditure on scientific research and development has increased by 40 per cent. (£177,800,000) over the past three years and last year totalled £477,800,000, or 2.3 per cent. of the gross national product. During the same period the expenditure by industry increased by £81,300,000 to £266,300,000 last year and now accounts for 29 per cent. of total UK research expenditure, compared with 23 per cent. in 1955-56.

The report states that further work is needed in many fields owing to the wide disparities in the proportion of skilled manpower devoted to research and development by various groups of industries. In particular there is much evidence that UK engineering development is intimately bound up with the economic production of new materials, such as electrical conductors, semi-conductors, insulating materials, magnetic materials, and structural materials, and the improvement of existing ones.

There is a particular need for materials capable of operating at much higher temperatures than at present. A greater effort involving much improved collaboration between chemists, physicists, mathematicians, and metallurgists, both in universities and in industry, is required to overcome this gap.

The Ministry of Power and the University Grants Committee have been invited to consider ways of strengthening studies in coal technology at universities or colleges of advanced technology. More research into energy sources and their utilization is required, as is also the further application in industry of refined techniques of calculation and automatic control.

# *SCOW Work's Appointments at Trostre*

FOLLOWING the appointment of Mr. G. E. Turpin and Mr. E. H. Vaughan as chief engineer and deputy chief engineer, respectively, of the Trostre plant of the Steel Company of Wales, Limited, a number of other promotions have taken place. Mr. A. C. Jardine, plant engineer, has been appointed mechanical engineer. He was actively associated with the construction of the Trostre plant and when it came into operation was appointed services engineer. He became plant engineer in 1956.

Mr. Jardine's assistant is Mr. S. Harry, formerly assistant spares engineer. Mr. A. Rees has been appointed mechanical maintenance engineer, Mr. D. Wimmers, chief draughtsman, Mr. J. Coomey, day foreman (east), Mr. H. Davis, new work engineer, and Mr. R. Evason, assistant new work engineer.

THE NEW WORK department of the Steel Company of Wales, Limited, has set up a new safety record for the company. Its 314 accident-free days beats by 35 days the previous record set up by the metallurgical department in September, 1958.

# *Facing up to Oil*

## CALL FOR COMMON FRONT OF SOLID FUEL INTERESTS

"INTERNECINE warfare between oil and solid fuel goes on. There is no common front of the solid fuel interests. Surely the time has come for us to get together and iron out our differences—difficult though that may be." That plea was made in London on Monday by General Sir Campbell Hardy, the recently appointed director of the Coal Utilisation Council, at a Coal Industry Society luncheon. He referred to the determination of most merchants to face their problems and overcome them.

Sir Campbell foresaw an alarming increase in the imports of oil into this country, with a corresponding increase in other industrial countries, particularly the United States. Of British oil imports, about 75 per cent. came from the Middle East; about 25 per cent. came from the Caribbean, and a dribble came from other places.

SIR CAMPBELL HARDY

Opinions differed about the world's reserves of oil, but, said the speaker, "it is perhaps worth knowing that of the known reserves about 62 per cent. lie in the Middle East, only 8 per cent. in the Caribbean, and about 10 per cent. in Russia and her satellites." It was necessary for this country to reduce her dependence on unreliable sources of oil. He did not see any plan to make greater use of our own fuel. Perhaps such a plan was not necessary, but he was not convinced of that being so.

### Distribution Problems

Regarding the perennial problem of distribution, Sir Campbell Hardy referred to the views of those who asked him about the shortage of railway stock and merchants' inability to carry heavy stocks for a long period. "Can't the Coal Board and factors get together to evolve a scheme for better distribution of coal stocks throughout the country or cannot the coal merchants be given better terms to persuade them to hold bigger stocks in the summer?"

While most merchants were determined to overcome their problems, inevitably there were those who found it too difficult to escape from the apathy which was the natural heritage of controls. "I have heard too many cases of the chuck-it-or-leave-it attitude which does harm out of all proportion to the number of culprits involved," he said. "My fear is the personal feeling of frustration which, let us face it, is fairly widespread. If ever there was a time for leadership and a rallying call this is it."

If these fears were likely to be borne out by fact in a cold winter and cold homes "then in my view the time has come for an immediate operation by the Coal Board, by all distributors of solid fuel, and by the Government to redistribute stocks row by every available means." While that was being mounted the hard-hit outposts must share their existing rations. It would require a tremendous effort and be costly, but would it not be worth it for the welfare of the British people and the confidence of the trade? The only slogan they would require for years to come would be "Coal doesn't let you down."

## Oldest Coking Plant in Britain Closing this Month

BELIEVED to be the oldest in the country, Bankfoot Coking Plant, at Crook (Co. Durham), built in 1908, is to be closed at the end of this month. Foundry coke is produced at the ovens—the only ones now operating in Britain which were producing before the first world war. News of the closure was made known to workmen last week at a meeting attended by local officials of the NUM Cokemen's Area and representatives of Durham Divisional Coal Board.

Reasons for the closure, states the board, include a reduced demand for blast-furnace coke from the board's larger and more modern plants and a need to maintain the supply of gas for towns' use. The supply of gas can only be maintained by the more modern plants which, consequently, have been switched to the making of foundry coke with which gas production is associated.

Staff and workmen employed at Bankfoot total 204. Of these, a proportion will be retained at Bankfoot coal cleaning plants, which are to remain in operation. Some will also be retained temporarily for plant demolition, while a number of vacancies exist at other coking plants in the division arising from normal wastage. About 100 may be redundant and these men will qualify for redundancy payments under the board's Coke Redundancy Scheme.

## Herrington is Durham's Tidiest Pit

SURFACE tidiness competition run by the Durham Divisional Coal Board as part of a drive to greater safety has been won by Herrington Colliery for the third year in succession.

The results were as follow:—Class A (large pits): 1, Herrington; 2, Easington. Class B (medium pits): 1, Beamish Mary; 2, Kibblesworth. Class C (small pits): 1, Blackburn Fell; 2, Handen Hold.

*Personal*

# Mr. Robens Joins the Board

FUTURE chairman of the National Coal Board, MR. ALFRED ROBENS, started officially in his new sphere of operations at Hobart House on Tuesday.

MR. ALFRED ROBENS

For the next four months Mr. Robens will be "understudying" the present chairman, Sir James Bowman, until the latter's retirement on January 31, 1961. During that time Mr. Robens will be visiting coalfields, meeting people, and generally getting the feel of the industry of which he will be the head for the next five years. His first full board meeting is today (Friday).

The announcement of the appointment of the Labour MP for Blyth as Sir James's successor was made on June 16. Mr. Robens has been the member for Blyth since 1950 and before that was for five years MP for the Wansbeck Division of Northumberland. For four years (until 1951) he served as Parliamentary Secretary to the Ministry of Fuel and Power and from April, 1951, was, for six months, Minister of Labour.

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British Standards Institution has re-elected Mr. R. E. HUFFAM for a third term of office as president.

Mr. T. W. WILCOX has been taken into partnership by Merz & McLellan, consulting engineers, of London, S.W.1.

After 49 years with Steel, Peech & Tozer, branch of the United Steel Companies, Limited, Mr. F. JONES has retired. Since 1947 he has been traffic manager of the company.

Mr. J. A. CHARLES has resigned his position as senior metallurgist with British Oxygen Research & Development, Limited, to take up an appointment as Lecturer in Metallurgy at Cambridge University.

Presentation was made recently to Mr. GEORGE BISHOP on his retirement as manager of Ramcroft Colliery (Derbyshire). Before joining Ramcroft in 1952 he was manager of Bolsover Colliery (Derbyshire).

Mr. GEORGE INVERARITY, Area production manager for No. 1 Area, the East Midlands Divisional Coal Board, has been installed as president for the coming year of Chesterfield and District Caledonian Association.

Chancellor of the Exchequer has appointed Mr. W. C. REID, a director of Albion Motors, Limited, as a member of the Scottish Board for Industry for a term of three years. Mr. Reid will represent the employers on the board.

GOLDEN WEDDING anniversary of Mr. and Mrs. R. L. WOOSNAM was celebrated on Friday last. Mr. Woosnam is chairman and co-founder of the Premier Lamp & Engineering Company, Limited, manufacturers of miners' acetylene lamps, etc., of Leeds.

Mr. C. F. GRUNDY, managing director of the Cementation, Limited, group left on Monday for a 10-day business tour of India. He will visit the Durgapur steelworks in West Bengal on which Cementation is carrying out civil engineering work, worth £18,000,000, in association with the Patel Engineering Company, Limited.

Presentations have been made to two officials of No. 2 Area, Durham Divisional Coal Board, who retired at the end of September. The recipients were Mr. W. L. TULIP, chief engineer for the Area, and Mr. JAMES L. BAKER, Area electrical engineer. Before vesting date both officials were with Lambton Hetton & Joicey Collieries, Limited.

Mr. J. G. DAWSON, director of engineering of F. Perkins, Limited, diesel engine manufacturers, of Peterborough, has succeeded Mr. V. H. HOPKINS as chairman of the council of the British Internal Combustion Engine Research Association. Mr. S. J. WOOD, manager of the diesel engine department of W. H. Allen, Sons & Company, Limited, Bedford, has been elected vice-chairman.

Presentation was made recently to Mr. RICHARD JOBLING, group manager (planning) of Group "A" of the No. 2 (Mid-East Durham) Area of the Durham Divisional Coal Board, on his retirement. He began his career as a student at Langley Park Colliery, becoming undermanager there in 1921. Eleven years later he became undermanager at Dawdon Colliery of which he was appointed manager in 1948. He took up his last post in 1952.

Consulting electrical engineer of Newton Chambers & Company, Limited, Thorncliffe, Sheffield, Mr. JOHN VICTOR RODGERS, received a presentation from Mr. L. Godber, local director and general manager of services, on his retirement recently. Mr. Rodgers joined the company in 1911 as an electrical apprentice on colliery installations. In 1925 he became electrical engineer of the Hoyland Silkstone Colliery by-product plant. On vesting date he became chief electrical engineer, of Newton Chambers, which post he held until 1959.

At the opening session of the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne on October 17, Mr. JAMES B. WOODESON, chairman of Clarke, Chapman & Company, Limited, the Gateshead engineering firm, will be installed as president. He succeeds Mr. E. J. Hunter, chairman of Swan, Hunter, & Wigham Richardson, Limited, the Tyne shipbuilders, who has held office for two years. Mr. W. A. Woodeson, father of the new president, was president from 1940 to 1942. The new vice-president will be Mr. R. IBISON, director and general manager of Hawthorn, Leslie & Company (Shipbuilders), Limited.

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## New Deputy Production Manager for North Staffs.

WITH effect from January 1, Mr. L. W. Fletcher will take over as deputy production manager (operations) of the North Staffordshire Area of the West Midlands Divisional Coal Board from Mr. J. Hebblethwaite, who is retiring. Mr. Fletcher is at present manager of the No. 2 group of the North Staffordshire Area, a post he took after holding a similar one in the No. 3 Group of the Area.

Mr. Hebblethwaite's retirement marks the end of more than 50 years in the coal industry. He has held senior management posts in the Area since nationalization, immediately preceding which he was agent/manager of Victoria Colliery, for Norton & Biddulph Collieries, Limited. He has held his present post for the past five years and has also carried out a number of special assignments for the board.

# Coal Price Increase

## *CAUSES JOINT IRON COUNCIL CONCERN*

DEEP concern about the increase in coal prices, particularly regarding its effect on the ironfounding industry and the economy as a whole is expressed in a letter which has been sent to the Industrial Coal Consumers' Council from Mr. Kenneth Marshall, director, on behalf of the Joint Iron Council. The Consumers' Council is asked to report these and other such representations to the Minister of Power.

Maintaining that the National Coal Board has failed to establish its case for a rise in prices over and above that required to meet the cost of the arbitration award, the Joint Iron Council challenges the policy of charging the cost of reducing the output from the mines to the consumer, whether approved by the Government or not. It would appear that the rate of this adjustment has been deliberately slowed down for social reasons.

The NCB is also criticized for having taken " the easy way out " and so depriving itself of a powerful incentive to greater economies by discounting too heavily the economies that should result from increased productivity and concentrating production in the more efficient units.

### Possible Cost to Ironfounding

The effect on the ironfounding industry is shown by figures of fuel consumption for the first half of 1960. The industry used 429,000 tons of foundry coke, 66,100 tons of blast-furnace coke, 28,300 tons of gas coke, and 158,400 tons of coal. At this consumption rate the actual and proposed solid fuel price increases would cost the industry some £966,000 in a full year, or 4s. 9d. on every ton of iron castings produced.

In addition, it is claimed, the price of blast-furnace coke will cost the pig-iron makers some £1,720,000 for a full year's supply of iron to the ironfounders. If this additional cost were to be passed on in full to the ironfounders it would be equal to 8s. 5d. for each ton of iron castings produced.

The total direct increase in cost could therefore be 13s. 2d. per ton of castings produced, but this takes no account of all the indirect costs such as rail transport, electricity, gas, etc. The JIC suggests that taking all factors into account the increase could be equal to or exceed £1 per ton of iron castings.

Mr. Marshall points out that the pressure of alternative products to iron castings will be intensified and, if successful, will lead to a reduction of output which in turn would lead to lower fuel consumption. At the same time, the increase will mean harder competition abroad and a corresponding loss of markets.

There is a further warning note. Added stimulus will be given towards substitution of alternative fuels and, although in the case of the ironfoundries this is only possible at the present time to a limited extent, further research on the problem may well produce an answer in the course of time.

Finally the Joint Iron Council urges a further examination of the matter " if the worst consequences are not to be repeated on another and perhaps not far distant occasion."

## *Minister of Power Decries Pessimism*

"COAL has a perfectly good and clear future, so long as it can attract and is competitive and efficient. People who are getting pessimistic and leaving the pits are not doing the industry much good." Mr. Richard Wood, the Minister of Power, said this last week after he had paid a surprise visit to Hem Heath Colliery (Staffs). Mr. Wood spent an hour and a half underground.

The pit is North Staffordshire's " show pit " and is the deepest in the country. Mr. Wood said that he hoped it would keep on producing a lot of coal at a high rate of output per manshift. " Obviously to do that," he said, " there has got to be more men down the pit." He was well aware that the shortage of manpower was one of the great concerns of the Division. Both the board and the Government were bound to be anxious about the position. Recruiting was going on, however, and he hoped it would be possible to make up the required numbers.

Mr. Wood went on to say that he was impressed with development progress in North Staffordshire, which had a major part to play in the industry's future. By 1965, he said, the board aimed at getting at least 80 per cent. of its coal from new and reconstructed pits.

## Final of West Midlands' Mines Rescue Competition

FINAL of the West Midlands Divisional Coal Board's mines rescue competition will be held at Birmingham University tomorrow (Saturday). The final will be contested by the Area finalists. Taking part are:—North Staffordshire, Deep Pit; Cannock Chase, Littleton; South Staffordshire and Shropshire, Highley; Warwickshire, Birch Coppice. Birch Coppice has reached the final five times and has won for the past four years.

The underground test will be judged by Mr. F. D. A. Boam, HM Inspector of Mines, and the oral and first-aid tests by Mr. B. B. Burrows, mining department of Birmingham University, and Dr. T. K. Elliott, medical officer of the West Midlands Divisional Coal Board, respectively.

ROAD TUNNEL, linking the proposed new administrative office block of Steel, Peech & Tozer, branch of the United Steel Companies, Limited, with its mill at Brinsworth, has been approved by Rotherham property committee.

*Appointments*

# Scottish NCB's New Deputy Marketing Director

FOLLOWING the appointment of Mr. William MacLeod as Divisional marketing director of the Scottish Divisional Coal Board, Mr. GEORGE M. MCNEIL has been made deputy marketing director (commercial) of the board. Mr. McNeil was educated at Hutchesons' Grammar School, Glasgow, and he joined the Glasgow coal exporting company of James H. Sharpe & Company, Limited, in 1927.

In 1938 he joined the Lanarkshire area control and sales committee of the Scottish District Coal Mines Scheme with which he remained until the war. On vesting date, Mr. McNeil became a member of the Central Areas marketing department staff and in 1948 was appointed Divisional marketing officer at Scottish Divisional headquarters. He was coal export officer for Scotland from 1949 until 1958.

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Mr. P. B. HAMILTON has been appointed personal assistant to Mr. C. W. Hayward, chairman of Firth Cleveland, Limited, group.

Mr. J. FAULDS has now become the technical sales representative for the products of the Kelvin & Hughes, Limited, group in north and north-eastern England.

Mr. RAYMOND E. BOULTON, fore-overman at Blackhall Colliery (Co. Durham), has been appointed undermanager at Fishburn Colliery in the same county.

As from Monday Mr. E. F. CLARKE will be chief engineer of Guy Motors, Limited, Wolverhampton. He was previously project engineer with Dennis Bros., Limited.

Mr. GEOFFREY LINEY, head of the department of engineering at Coalville (Leics) Mining and Technical College, has been appointed principal of Castleford-Whitwood Mining and Technical College.

Personnel officer for three years at the Sunderland shipyard of Austin & Pickersgill, Limited, Mr. LESLIE WILSON, has been appointed personnel manager with International Alloys, Limited, Aylesbury (Bucks).

Mr. W. G. LARBY has been appointed area sales manager (explosives) of Imperial Chemical Industries, Limited, explosives sales office, Denaby Main, Doncaster, following the retirement of Mr. F. I. Davies.

Mr. R. S. GLAISTER has been appointed customer liaison engineer by Panellit, Limited, data handling system manufacturers, of London, N.W.10, a member company of the Elliott-Automation, Limited, group.

Mr. NORMAN SCHOFIELD, manager of Wombwell Main Colliery, Barnsley (Yorks), for three and a half years, has been appointed manager of Barrow Colliery. He will be succeeded at Wombwell Main by Mr. John Lee, of Grange Colliery.

Mr. W. J. RENTON has joined Massey-Ferguson, Limited, agricultural machinery manufacturers, of Manchester, as general shipping and traffic manager. He was formerly export order and shipping department manager with Kelvinator, Limited.

Dr. D. J. MYLES, lecturer in the mechanical, civil, and production engineering department at Dundee Technical College, has been appointed principal scientific officer in the National Engineering Laboratories at East Kilbride, near Glasgow. He is succeeded by Mr. WILLIAM Y. WILSON.

Within a month of his appointment as personnel officer in the steel division of the Steel Company of Wales, Limited, Mr. G. L. DENNIS has been promoted to superintendent, personnel services. He succeeds Mr. K. D. M. Dauncey, who has been appointed director of personnel, Elliott-Automation, Limited.

Mr. M. WADE, formerly cost accountant, has been appointed works accountant, of Barrow Steel Works, Limited, Barrow-in-Furness (Lancs), to be responsible to the secretary for the management and development of the works accounting service. He will also be responsible for development work on the works records service. Mr. E. HOLME has been appointed chief cost clerk responsible for the detailed running of the cost department.

Mr. E. H. WILLIAMS, who has been appointed as manager of Hampstead Colliery, South Staffordshire and Shropshire Area, West Midlands Divisional Coal Board, has had previous experience in the Cannock Chase and North Staffordshire coalfields as well as in the South Staffordshire and Shropshire Area. He has been reserve manager in the South Staffordshire and Shropshire Area since September, 1957. Mr. R. BRIGGS, the former manager at Hampstead, has left the board to carry on a family concern.

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# *Five Pits to Close in Northumberland*

FIVE Northumberland collieries have been nominated by the National Coal Board for graduated closing within the next year. In all over 2,000 men will be affected by the shut-down of Broomhill, Chevington Drift, North Seaton, Hartford, and Mickley collieries. In addition to the closures Seghill Colliery is to decrease production with consequent redundancy.

Mr. Robert Main, secretary of the Northumberland Area of the National Union of Mineworkers, said that there would be discussions between the NCB and the union before the closings were definitely settled. It was fairly certain, however, that the pits would be closed, he said.

Mr. John T. Crackett, Broomhill representative on the NUM county executive, said it was felt that apart from economic pressures there was no reason why that pit should not carry on. "We are not far short of our daily target of 480 tons, and it is disappointing to have this grim news when two years' ago we were assured that there was still 17 years of life in the old pit," he said.

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# Connell Group Extends Activities to the South

THE old-established firm of metal and machinery merchants, William Urquhart, London, S.W.17, has been acquired by James N. Connell Holdings, Limited. The company has dealt in steel and non-ferrous metals for over 54 years and has extensive scrap and stock yards in south west London, under the management of Mr. R. Urquhart, a past president of the National Federation of Scrap Iron and Steel Metal Merchants.

The activities of William Urquhart, which include dismantling and disposal of machine tools and engineering plant, are similar to the activities carried out in Scotland by the Connell group of companies. The acquisition enables the Connell group to extend its specialized services in the south and will serve as a launching site for further development.

# SIX BELLS EXPLOSION

## *Submission by Sir Andrew Bryan at Public Inquiry*

BEFORE beginning his submission, as the representative of the National Association of Colliery Managers and the British Association of Colliery Management, at the closing session of the inquiry into the Six Bells Colliery explosion, Sir Andrew Bryan joined the two associations, as well as the members of the management team at the pit, in the expressions of sympathy made by earlier speakers. He also extended the thanks of the two associations for the work done in the recovery operations immediately following the explosion.

Sir Andrew had first a word to say about the comments made by Mr. E. Ryder Richardson, QC, for the National Union of Mineworkers, and others, concerning the order of examination at the inquiry.

"I do not accept the view that they have expressed," he said. "While everyone who works in a colliery undoubtedly has responsibilities, none has anything like the responsibility that rests with the manager, and for that reason—and that reason alone—I suggest to you that it is only right, both in equity and in justice, that the representative of the manager should be the last to examine witnesses."

### Submissions Made

Mr. T. A. Rogers, HM Chief Inspector of Mines, who conducted the inquiry, had heard already five submissions from the representatives of other parties to the inquiry, Sir Andrew said. Those submissions had covered many points, some in considerable detail. With some of the submissions made, Sir Andrew said, he was in more or less full agreement. There were others which, in his view, were not borne out, either in whole or in part, by the evidence before the court.

"It is generally agreed, I think, that to know what caused a disaster is a very big step on the way to suggesting a means of preventing a recurrence. With a knowledge of what has happened, consideration can then be given to the measures necessary either for eliminating or at the very least guarding against any defects that may arise from it," Sir Andrew said.

To try to find out what caused the explosion at Six Bells on June 28 of this year—the most serious, and, he believed, the only major disaster in the Monmouthshire coalfield since the explosion at the neighbouring Marine Colliery 33 years ago—that part of the Six Bells Colliery concerned in the explosion had been the subject of very extensive, detailed, and comprehensive investigations.

Much of the result of those inspections, investigations, and examinations had been presented in the evidence given at the inquiry. In addition, prior to the commencement of the inquiry, preliminary statements were obtained from about 150 people who had worked in the colliery. Of the people interviewed, between 60 and 70 of them had given evidence before the court.

The court had obtained a very considerable body of factual information on the conditions and circumstances appertaining in the "W" District of the Old Coal Seam both prior to and immediately following the explosion on June 28. Sir Andrew continued:—

"I do not think it would serve any very useful purpose if I were to deal further with a number of the matters of detail that have been brought to your notice at this inquiry, many of which—and this has already been stressed—are not directly related to this explosion, however important or unimportant they may be.

"In respect of a number of them—for example, searching for contraband, examination of safety lamps, authorization of mechanics of the mine and the persons to carry flame safety lamps, the accuracy of records, and so on—I would like to associate myself fully with what, in particular, Mr. Baker has said on these matters.

"On other matters, such as the references made by a number of witnesses to the heating of bearings and the emission of sparks, the evidence about them, if not perhaps complete or entirely accurate in some instances, is certainly fairly lengthy. Heating of bearings from time to time is, I suggest, a more or less normal happening in places where machinery is used. So far as the heatings to which reference was made in this court are concerned, the evidence, in my submission, makes it abundantly clear that such heatings were relatively infrequent occurrences, and that as soon as the attention of the officials was drawn to them, the necessary and proper steps were taken to deal with the trouble promptly and effectively.

### Emission of Sparks

"On the emission of sparks in the 'W' District on several occasions, as described by a number of witnesses, there is little that I can add that would be in any way helpful to you. It is well known that there are 'sparks' and 'sparks,' and, indeed, that many of the sparks generated in the ordinary working of some coal mines are quite incapable of igniting firedamp. But that some sparks can ignite firedamp there is no doubt. The evidence given by Mr. Hartwell clearly shows that, under certain conditions, sparks generated by the falling of pieces of at least one particular bed of rock found in the district of the explosion could, and did, under experimental conditions in the laboratory, ignite a firedamp-air mixture.

"The possibility of an incendive spark occurring in the workings of the Old Coal Seam in the 'W' District at the time this explosion started cannot be ruled out. Nor can the possibility that such sparks could derive from the falling of stones from a particular bed of rock which was found in the roof of the ripping as well as along part of O.10's face. The sparks could be generated by the falling of rock upon rock, or by falls of rock either on steel supports used at the face or on the steel 'chapel' used to protect the conveyor

when ripping operations were in progress on the O.10's main gate.

"Upon whether or not an incendive spark generated in these ways in fact was the actual or indeed a highly probable source of ignition in this explosion, I propose to comment later when discussing the various theories put forward in explanation of what happened.

### The Explosion

"Let me now come to the evidence about the actual explosion, how it was caused and how it was propagated. From the evidence, at least two things are, I submit, clear, and, indeed, probably generally accepted by all parties. The first is that the explosion began by the ignition of a firedamp-air mixture within the 'W' District; and the second that the explosion was propagated mainly by coal dust.

"That firedamp also played some part—but only a small part—in the subsequent development and spread of the explosion is highly probable. On the part played by firedamp, the evidence of burning suggests that some gas was present in the rippings of O.10's main gate, O.18's tail gate, and O.10's supply gate at the return end of O.10's face.

"It is also clear that while the area covered by this explosion was fairly extensive, the explosion could not be regarded as a violent one.

"In investigations made to discover the nature of an explosion important aims are:—

"(1) To establish the point of origin; (2) the nature of the fuel ignited there; (3) the extent and the paths travelled by the explosion; and (4) the nature of the fuel responsible for its propagation.

"Once the point of origin is clearly established, further close study in and around the site usually leads to the discovery of a source of ignition—if, indeed, that is not already self-evident.

"It was with a view to determining, among other things, the points that I have just enumerated that the very careful and painstaking examinations and studies were made by representatives of the various parties, but especially by the officers of SMRE and by certain of HM Inspectors, of the two main effects of the explosion—blast and burning.

"The officers of the Safety in Mines Research Establishment, as Mr. Hartwell has told us, collected specimens for laboratory examinations from a total length of 4,200 yds. of the roadways and faces inbye the 'turn' in the 'W' district.

"These investigations included the examination of fibres and dust samples under the microscope, as well as a very close inspection of timber, painted surfaces, paper or other combustible substances, for signs of heating or burning. They also included a close inspection of materials and equipment, both heavy and light, that may have been dislodged, moved, or displaced by the blast of the explosion.

"From these investigations the members of the SMRE team were able to come to conclusions about the spread of the flame, thus defining the extent of the explosion, and also about the indications of blast which enabled them to suggest the paths taken by the explosion as it spread over the affected part of the mine.

"From a study of these factors, Mr. Hartwell and his colleagues were able to arrive at what they considered to be the most likely point of origin, which they fixed as being in the region of O.10's main gate ripping.

"They did not, however, entirely rule out the point of origin as being at the junction of the return end of O.10's face with O.10's supply gate, or even in a part of the waste behind the O.10's face.

"Having thus determined the likely point of origin, a close search then began to discover the source of ignition, since the source of ignition was certainly not obvious. The evidence suggests it was not an easy matter to determine, but to this end, special examinations and tests were carried out by SMRE and HM Inspectors, and they were described in the reports of the SMRE which were handed in as documents to the court and, in respect of the machinery, in the evidence given by HM Inspectors of Mines.

"From these examinations and tests, it is possible, I submit, to exclude several possible sources of ignition that were considered. These, I suggest, are:—Electrical and signalling apparatus and mechanical appliances; lamps, flame and electric; electrostatic charge on the casing of the venturi devices used in O.18's; and couplings on compressed air pipes on O.12's.

"One possible source that could not be excluded was frictional sparking from the falling of rock upon rock, or upon steel.

"The examination made of a particular rock in the neighbourhood of O.10's ripping in O.10's intake and supply gate revealed a hard quartzitic sandstone which proved capable of generating incendive sparks when submitted to impact tests in which the rock was struck by a steel pick in the presence of an inflammable firedamp-air mixture.

"Another source of ignition considered was that of a hanging flame from one of the ripping shots in O.10's main gate. These shots had been fired about seven or eight hours before the explosion occurred.

"The suggestion put forward was that some gas in a roof bed separation had been ignited by one of these ripping shots and that the gas had burned unknown by anyone until, in due course, it came into contact with an explosive firedamp-air mixture of sufficient quantity and concentration that, when it exploded, it raised coal dust on the O.10's main gate and initiated a coal dust explosion.

"This coal dust explosion, once started, was propagated through the roadways and faces shown on the plan produced by Mr. Hartwell—a plan which was marked to show the passage of flame and direction of blast throughout the roadways and faces concerned.

"The conclusions reached about the place of origin, the most probable source of ignition, the direction of blast, the nature of the fuel, the extent of burning and the spread of the explosion were, I believe, acceptable to all the witnesses who expressed views on these matters, with perhaps in respect of one or two things the exception of Mr. Albert Davies, of the Safety Department of the NUM.

"Mr. Davies expressed the view that the explosion started from a hanging flame of relatively short duration caused by shotfiring in O.18's tail gate, and that in some way this hanging flame caused a gas ignition or explosion which eventually traversed the area outlined in Mr. Hartwell's explosion plan.

"I would submit, Sir, that on the evidence, any suggestion that the explosion started in O.18's and not on O.10's must be ruled out.

### Probable Causes

"Of the two probable sources of ignition, Mr. Lynden James, head of the Safety Department of the South Wales Area of the NUM, thought the hanging flame the more probable, while Mr. Hartwell, of SMRE, Mr. Fear, HM Senior District Inspector, and the manager of the colliery had a preference for frictional sparking from falling rock.

"Mr. Hartwell and Mr. Fear, you may recall, did not rule out the possibility that a spark from a stone falling inside, but near the waste edge towards the

intake end of O.10's face, or indeed a spark derived from a pick striking hard rock at or near the junction of the return end of O.10's face with O.10's supply gate, could have started off the explosion. Mr. Hartwell thought, however, that the chances of it starting at either of these places were more remote because each required a greater number of coincidences to account for them.

"I would submit, Sir, that while evidence suggests that an explosion starting at O.10's main gate ripping lip, and triggered off by frictional sparking from falling rock on steel, is the most probable explanation of what happened, that cannot be said with sufficient degree of certainty to be truly satisfying. There is something we perhaps do not yet know about what happened in this particular case.

"It is perhaps only fair to point out that incendive frictional sparks from falling rock could occur in the waste, where support rules do not apply, and, also, that, as was pointed out by Mr. Lynden James, a hang-fire could occur from the firing of a shot, even if all the shotfiring regulations were carried out.

"Where did the gas come from that started this explosion? From the evidence it is clear that gas in quantity or concentration detectable by a flame safety lamp was seldom found at O.10's ripping face, which, I submit, suggests that something very unusual had happened to cause an accumulation at the time of the explosion.

"To account for the accumulation of the required volume of the explosive firedamp-air mixture at O.10's ripping, which was necessary to start a coal dust explosion, there were slightly conflicting views. I would submit, Sir, that the most likely explanation was a derangement of the ventilation in O.10's caused by the opening of the two doors at the foot of O.10's supply gate, coupled with an extra emission of gas from the feeder, which Mr. Fear described, on the left side of O.10's main gate not far from the ripping face.

### Use of Probes

"Let me now say a word or two on some matters which seem to me to arise from or have been brought out during this inquiry.

"Mr. Baker has said that he would leave this question of probes to me. The use of probes is an important matter and in many mines it is essential that they should be used. If we are to get the information necessary for safety it seems to me that a probe must be a necessary part of the equipment of those whose job is to make ventilation surveys and special investigations of that nature. But I would submit that to require the provision and use of probes by other officials of the mine, except when engaged on special investigations relating to ventilation and gas emission, is not necessary.

"On the firing of shots in the vicinity of places where hurdle sheets, small fans, venturi, or injector devices are used to deal with small gas emissions, I would submit that proper compliance with the present strict regulations governing shotfiring affords adequate safeguard against danger. Of course, where shotfiring is practised in the neighbourhood of breaks attention must be given to the circumstances that prevail. But I think it right to say that the prohibition of shotfiring in any place where gas can be detected on the flame of a safety lamp ensures a very large and high margin of safety.

"Much has been said about compliance with regulations. To ensure full compliance with all statutory requirements is an ideal to be aimed at. No one would deny the importance of attempting to do so and I would be the last, and so would the two associations I represent, to condone breaches of the regulations.

"But I feel I must say this in all fairness: It does seem to me to be difficult for those who are not actually engaged in the management of a coal mine, to realize how terribly difficult it is for anyone in that position to ensure constant compliance with each and every statutory requirement.

"The manager of a colliery has a truly difficult and responsible task. You have had the advantage, Sir, of seeing Mr. Luther, the manager at Six Bells, undergo a long and gruelling examination in the witness box. I think you must have been impressed—as I certainly have been—by his honesty and forthrightness, and I hope that, despite the frank admissions he has made about the absence of stone dust barriers, the failure to report on occasions the presence of more than 1 per cent. of firedamp to HM Inspector, you will agree that he worked hard and conscientiously and long in the performance of his difficult job.

### Application of Inert Dust

"Now, despite what Mr. Ryder Richardson has alleged about slackness and conditions prevailing in the explosion district, I suggest the picture you can gain from the evidence is that the 'W' section of this mine was one in which the roadways and the working faces were well supported and maintained; one where the deputies made keen inspections for gas and reported gas when it was found; one where prompt and proper steps were taken to deal with emissions of gas when they occurred; one where shotfiring was prohibited in the O.18's main gate when the feeder of gas was detected there, and where the size of the ripping lip was reduced; one where close attention was given to O.18's tail gate ripping and where shotfiring was only carried out there when the officials were satisfied that it was safe to do so; a district where machinery defects were corrected as soon as practicable; and one where the installation and maintenance of mechanical and electrical apparatus was—as we have heard from HM Electrical and Mechanical Inspectors of Mines—of a high standard.

"A feature of this explosion—and a very important feature—was that its spread was confined almost entirely to faces and roadways on which conveyors were working or installed. It has become apparent in recent years to mining people that progress and practice in the application of inert dust to guard against the danger from coal dust in conveyor roadways has not kept pace with increasing knowledge of these dangers.

"This is a matter which—I think to your own knowledge, Sir—has been under very active consideration at the Ministry and also by the National Consultative Council of the industry. It is to be hoped that, from the consideration now being given to this matter, action will soon stem which will mark a big advance towards greater safety where conveyors are in use.

"And now I come to my final point. I would respectfully suggest that the coal-mining industry is not reaping anything like the advantage in safety that it ought to derive from the number of people in it who are engaged in making inspections and investigations with a view to safety. I would submit, therefore, that there is an urgent need for intensive operational research with a view to discovering ways and means of improving the effectiveness of the large manpower that is now employed in the very important field of safety.

"I conclude, Sir, with the great hope that as a result of this inquiry, you will be able to make recommendations that will prevent a recurrence of a happening of the nature of that which unfortunately occurred at Six Bells in June of this year."

*Orders Placed*

# £1,000,000 NCB Contract for Birtley Engineering

THREE coal preparation plants have been ordered from Birtley Engineering, Limited, at Chesterfield, a subsidiary of the Birmingham Small Arms Company, Limited, by the National Coal Board. Together, the orders are worth about £1,000,000. The plants are to be built at Kellingley, Cadley Hill, and Brookhouse collieries. All will be of the tromp dense medium type, for which Birtley Engineering holds the licence to build in the UK.

The civil engineering work at Cadley Hill will be carried out by the NCB under the direction of Birtley designers, while at Brookhouse all the construction work will be undertaken by the company.

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RUSSIA has ordered two mass spectrometers from Associated Electrical Industries, Limited. The equipment, which is the first of its kind to be made commercially available, is worth £50,000 and will be used in research work in nuclear and electronic engineering.

CONTRACT for the constructional work on the Donnington road bridge scheme to link the two southerly approaches to Oxford has been awarded to the Cementation Company, Limited. The contract is worth £310,000 and work is expected to begin immediately.

THE SUPPLY and installation of a limestone crushing screening, conveying, and loading plant for Colvilles, Limited, at Harrendale (Cumberland), is to be undertaken by Keir & Cawder (Engineering), Limited. The plant, worth £300,000, will have an ultimate production of 400 tons an hour and will supply crushed limestone to the new Ravenscraig steel mills.

ORDERS worth more than £4,000,000 have been placed by London Transport for 619 new high-capacity "silver" tube cars to complete the replacement of rolling stock on the Central and Piccadilly lines. The Birmingham Railway Carriage & Wagon Company, Limited, is to supply 450 car bodies and bogies and the remaining 169 will be built at British Railways' Derby works.

DESIGN AND CONSTRUCTION of an ammonia plant and auxiliary facilities for US Phosphoric Products, of Tampa, Florida, is to be undertaken by the Chemical Construction Corporation. This brings the total number of ammonia plants designed by Chemco to 75 and is the 14th to be built by the company since 1958. The new plant will process natural gas and will have a capacity of 350 tons a day.

ORDER worth over £176,000 has been placed with the General Electric Company, Limited, by the Central Electricity Generating Board for its Blyth "B" generating station. Six 2,150 h.p. booster pump motors and four 4,750 h.p. standby variable-speed boiler feed pump motors with liquid controllers are being made to the order of Hawthorn, Davey & Company, Limited, which is building the pumps.

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## *Steel Drum Manufacturers Cancel Agreement*

RESTRICTIONS contained in an agreement between members of the Association of Steel Drum Manufacturers have been cancelled by the association. This followed an agreed order made by the Restrictive Practices Court declaring the agreement contrary to the public interest.

Upon the association's undertaking not to enforce the agreement, the Registrar did not pursue his application for an injunction.

# Pit Workmanship Competition in Durham Division

WORKMANSHIP competition in the No. 6 (North-west Durham) Area of the Durham Divisional Coal Board for the first six months of 1960 has been won by Burnopfield Colliery, for the standard of work reached in driving and completing a new main road in the Tilley Seam, a length of which is illustrated. The roadway is supported by 12-ft. by 8-in. arches with mesh lagging, and is a good example of the work proceeding in the coalfield.

The competition is a facet of Durham division's campaign for greater safety, and is designed to encourage a high standard of workmanship among North-West Durham pitmen. Mr. J. A. Nimmo, No. 6 Area general manager, who has provided a silver cup, with miniatures, for bi-annual competition, presented the trophy to the colliery and mementoes to the men at a function held at Burnopfield, Newcastle-upon-Tyne, on Monday.

# Redeveloping Mining Areas

## EXPLORATORY CONFERENCE IN LUXEMBOURG

IT would be unrealistic to ignore the dangers to the future of the coal industry brought about by the formidable advances that other forms of energy had made during the past few years and which had largely contributed to the present critical situation. This warning was given by M. M. F. Vinck, an official of the High Authority of the European Coal and Steel Community at a five-day conference organized by the ECSC in Luxembourg.

The conference discussed the industrial redevelopment of areas affected by colliery closures and M. Vinck reminded delegates that taking co-ordinated steps now to meet adverse social and economic repercussions expected from the continuing contraction of Europe's coal industries did not mean that these industries were condemned to death.

Speedy reorganization of the coal industry in the affected region, resulting in higher output per manhour and subsequent competitive prices, could yet prove that a healthy industry could still play an important part in Europe's economy.

### Co-operation Impending

In some of the areas concerned the coal industry represented the sole basis of the region's economy, and to revitalize such areas, the delegates said, co-operation between governments was required, plus the combined assistance of the High Authority, the OEEC, and the European Investment Bank.

In seeking a solution delegates considered surveys on financial and resettlement means already available, and on actual experiences some countries in Western Europe have had in redeveloping depressed areas. The Newcastle-upon-Tyne area in Britain was one case studied, and Mr. S. H. Levine, of the Board of Trade, read a paper on the policy and practice of the British Government for dealing with local unemployment.

M. Reynaud, chairman of the conference, at a Press conference, said any policy would have to provide, among other solutions, for the inducements to new industries to move to the affected area. This called for publicity and for aid which might be made available to interested capitalists. Consideration would also have to be given to the problems that might arise from the Common Market if certain decisions were taken.

In every case, Mr. Reynaud concluded, the first initiative would lie with the individual governments concerned. But the ECSC also intended, as the holding of the conference itself had shown, to take co-ordinated action on behalf of the affected areas.

The conference was attended by delegations from the six member countries of the Community, and Britain, the International Labour Office, and OEEC. After further committee work the proposals will be put to the High Authority.

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K.G.M. ELECTRONICS, LIMITED, Richmond (Surrey), are now the sole distributors in the UK and Northern Ireland for Stenocord dictating machines and central dictating equipment. Servicing arrangements are also provided on a national basis.

## *Fall in Coal Demand Forecast for ECSC*

FINAL estimates for the coal market in the European Coal and Steel Community for the fourth quarter of this year have been issued by the High Authority. Demand for coal in the area is expected to be 2.5 per cent. lower than consumption in the same period last year, but total production is also expected to fall by 2,700,000 tons over the period. "Lost shifts" will account for a loss in production of 300,000 tons in both Belgium and France, and of 150,000 tons in West Germany.

With this drop due to short-time working, and the reduction of pit stocks by 2,300,000 tons for the whole area, ECSC coal stocks are expected to fall to 28,500,000 tons by the end of the year. Coal imports over the period will rise by 0.5 per cent., while exports of hard coal by the ECSC will go up by 4 per cent. and those of hard coke by 6 per cent.

Representatives of the French and West German Governments on the committee which prepares for the meetings of the Ministerial Council of ECSC have opposed any plan to extend past the end of September ECSC lost-time compensation payments to the Belgian coal-mining industry. They pointed out that over the first eight months of this year Belgian coal production reached 14,825,000 metric tons, against 14,814,000 tons during the same period last year, and that no real attempt to cut production had been made. The other members of the committee voted for the continuation of payments to Belgium until the remaining $1,000,000 in the ECSC fund is exhausted.

On Monday the working party formed by the ECSC, Euratom and the Common Market is to meet again to consider the energy co-ordination programme suggested for the Common Market area by the High Authority. The High Authority member, Dr. Hellweg, of Germany, will leave for New York the following day to negotiate with an American banking consortium for the planned ECSC loan, now expected to be $35,000,000.

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CAPPER PASS & SON, LIMITED, smelters and refiners of non-ferrous metals, of North Ferriby (Yorks)—The current financial year is satisfactory and will not compare unfavourably with the previous year, states the chairman, Lord Fraser of Lonsdale. Various plans for diversification are under active study and a further extension of the plant for copper production is planned.

*Board Changes*

# Mr. J. S. Brough Joins Mono Pumps

JOINING the board of MONO PUMPS, LIMITED, London, E.C.1, Mr. J. S. Brough is to become assistant managing director. He was formerly technical director of Humphreys & Glasgow, Limited, consulting gas engineers, of London, S.W.1.

Mr. Brough, who has spent his career in the engineering and chemical industries, was plant manager with Magnesium Elektron, Limited, during the war. He was chief chemical engineer, chief engineer, and general manager of production, respectively, of Monsanto Chemicals, Limited, until 1959 when he joined Humphreys & Glasgow.

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WM. CORY & SONS, LIMITED—Mr. A. L. Stock has joined the board.

BEESTON BOILER COMPANY, LIMITED—Mr. W. A. Spice has joined the board.

YORK SHIPLEY, LIMITED—Mr. J. K. Benson has retired after 31 years' service on the board.

NORTHERN WELDING COMPANY (NORTHAMPTON), LIMITED—Mr. R. Noble has joined the board.

BLACKBURN ENGINES, LIMITED—Air Commodore F. R. Banks has been appointed managing director.

SIMON-CARVES LIMITED—Mr. C. E. Wrangham, deputy chairman of Davy-Ashmore, Limited, has joined the board.

FREDERICK BRABY & COMPANY, LIMITED—After 34 years' service with the company, Mr. A. M. S. Baker has retired from the board.

TILLEY LAMP COMPANY, LIMITED—Mr. N. S. Banks has been appointed secretary. Mr. L. Sampson has resigned from the board and as secretary.

ALLIED IRONFOUNDERS, LIMITED—Mr. A. K. Craighead, Mr. T. I. Hobart, Mr. T. L. Reed, and Mr. G. E. Richards have been appointed directors.

PLESSEY COMPANY, LIMITED—Mr. E. J. Earnshaw has resigned from the board and from those of other companies within the group of which he is a director.

MITCHELL SHACKLETON & COMPANY, LIMITED—Mr. Francis J. Somers, chairman and joint managing director of Walter Somers, Limited, has been co-opted to the board.

WELLINGTON TUBE HOLDINGS, LIMITED—Following the acquisition of Gibbons (Dudley), Limited, Col. W. E. Gibbons has joined the board and Mr. R. D. Turner has joined the board of Gibbons (Dudley).

H. J. BALDWIN, LIMITED—Mr. J. S. Addyman, Mr. E. V. Byers, Mr. F. Chambers, Mr. J. R. Potts, and Mr. T. P. Summerton have resigned from the board. Mr. P. L. Oliver and Mr. Duncan Wright have been appointed directors.

BABCOCK & WILCOX OF AFRICA (PTY.), LIMITED—Sir Kenneth Hague, chairman of Babcock & Wilcox, Limited, has been appointed chairman of the African company in succession to Mr. Lief Egeland, who remains on the board.

WALTER SPENCER & COMPANY, LIMITED—Mr. F. W. Fletcher, London manager, Mr. R. H. Jackson, secretary, and Mr. H. Oxley, chief metallurgist, have been appointed to the board. Mr. F. Cramer has been appointed assistant secretary.

FIRTH BROWN TOOLS, LIMITED—Mr. L. R. Turner has been appointed director-finance as from November 1. He succeeds Mr. T. A. Wright, who is resigning for health reasons, and has been appointed a financial adviser of the parent company, John Brown & Company, Limited. Mr. Turner will also be appointed secretary of Firth Brown in succession to Mr. H. B. Hardwick who is retiring in March. Mr. J. R. Smyth has been appointed assistant secretary of the company.

BROOKHIRST IGRANIC, LIMITED—Mr. A. G. Herring has been appointed a director. He joined the company, a member of the Metal Industries, Limited, group, in 1929 and became general manager of the Chester factory earlier this year.

TEXTILE MACHINERY MAKERS, LIMITED—Sir Kenneth Preston, chairman of the parent company, Stone-Platt Industries, Limited, has resigned from the board. Mr. A. P. H. Aitken has been appointed chairman and Mr. A. J. S. Brown, a director.

J. T. ROTHWELL & COMPANY, LIMITED—Mr. F. Parkinson has retired as managing director. He is succeeded by Mr. H. Sullivan, director and assistant general manager. Mr. J. Whittaker, chief clerk and cashier, has been appointed secretary.

CLYDE STRUCTURAL IRON COMPANY, LIMITED—Mr. W. T. McLellan has resigned as chairman and managing director of the company which has been bought by George Davie & Sons, Limited, a Greenock holding company. He remains as technical consultant. Mr. D. G. Mitchell has been appointed chairman and Mr. Stuart Mitchell has joined the board.

DOWTY GROUP, LIMITED—Mr. Lionel Harper, a director of Coventry Precision, Limited, has been appointed vice-chairman of the board. He is also managing director of Dowty Hydraulic Units, Limited, and a director of Designex (Coventry), Limited. Mr. E. S. Gibbons, managing director of Designex has been appointed to the board of Coventry Precision.

RYLANDS BROS., LIMITED—Mr. R. S. Bleckly has been appointed joint managing director of the company and of Whitecross Company, Limited, in conjunction with Mr. G. K. Rylands, who was previously sole managing director. Both companies are subsidiaries of the Lancashire Steel Corporation, Limited. Commander S. H. Taylor has joined the boards of Lancashire Steel Manufacturing Company, Limited, Rylands, and Whitecross.

DAVIDSON & COMPANY, LIMITED—Mr. D. R. S. Turner has been appointed a director and general manager as from December 1. Mr. Turner, who had his early engineering training and experience with the British Thomson-Houston Company, Limited, Rugby, is already well-known in Northern Ireland, having been in charge of the development of the AEI Works at Larne from 1953 to 1958. Since 1958 he has been commercial manager of the turbine-generator division of AEI in Manchester.

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## *Minister of Power's Spadework*

SWIMMING POOL 45 ft. long and 15 ft. wide with a deep end of 7 ft. takes quite a lot of digging, as any miner will appreciate, but that is the task that the Minister of Power, Mr. Richard Wood, has completed at his home at Bishop Wilton (Yorks). According to the News Chronicle columnist, John London, it took Mr. Wood 14 months, mostly at the weekends, using only a spade.

The Minister lost both legs during a bombing attack in the North African campaign, but his modest comment on his labours was: "I am fairly fit you know. For the 12 years we've had the house I've always done a lot of digging. Frankly I didn't notice much of a strain with the pool."

## *Obituary*

# SIR CHARLES BRUCE-GARDNER

## Long Association with Steel Industry

LIFETIME of association with industry, particularly iron and steel, has ended with the death on Saturday of Sir Charles Bruce-Gardner. He was 72. Not only did Sir Charles contribute a very great deal to industrial affairs but his advice was greatly valued and often sought by Government departments and his services frequently given on committees and commissions concerning the subjects about which he was so well informed. In more recent years he did outstanding work as chairman of the British Iron and Steel Corporation, as adviser to the Board of Trade, and as deputy chairman of the Steel Company of Wales, Limited.

The son of the late Henry Gardner, a metal merchant, Sir Charles was educated at St. Dunstan's College and at Battersea Technical College. He served his engineering apprenticeship and after entering industry was for some years closely connected with the iron and steel industry in north Wales. He was a director of John Summers & Sons, Limited, from 1913 to 1930, a member of the Sheet Trade Board from 1914 to 1930 and a member of the Sheetmakers' Conference from 1915 to 1930.

Also during this period he was chairman of the Flintshire Coalowners' Association (1921-1930) and of the Galvanizing Conciliation Board (1920-1930), a member of the Central Council of Mining Association (1920-1930), and a County Councillor for Flintshire.

### Work for Industrial Reconversion

There followed an equally active period on a wider national scale. He was appointed chairman of the Iron and Steel Industrial Research Council, a member of the Advisory Committee of the Department of Overseas Trade, industrial adviser to the Governors of the Bank of England, and served as chairman of the London Iron and Steel Exchange in 1936 and 1937.

From 1938 and throughout the war he played a prominent part in the aircraft industry, particularly in furthering production efficiency, and in 1944, when the planning of the changeover of British industry from war to peace production was under consideration Sir Charles was chosen as Chief Executive for Industrial Reconversion.

This task completed, he took up his extensive industrial and financial interests and commitments once again. Until his retirement on reaching the age of 70, he had been for 12 years a director of Guest, Keen & Nettlefolds, Limited, and in the same year (1958) he retired from the board of John Lysaght, Limited, of which he had been chairman for many years. He also served as a director of a number of companies including the Consett Iron Company, Limited, Consett Marketing Company, Limited, and the British Steel Corporation, Limited.

He was knighted in 1938 and created baronet in 1945. He served as president of the Iron and Steel Institute in 1955-56 and was an honorary life member of the American Institute of Mining and Metallurgical Engineers and the American Society for Metals. He is succeeded by his elder son Mr. Douglas Bruce Bruce-Gardner who is also well known in the iron and steel industry.

A memorial service is to be held at All Souls' Vestry, Langham Place, London, W.1, on October 19 at 11.30 a.m.

## Lord Simon of Wythenshawe

BY the death on Monday of Lord Simon of Wythenshawe, the country has lost not only a great industrialist, but one who made an outstanding contribution to British social welfare. He will long be remembered for his work on behalf of housing, slum clearance, town planning, smoke abatement, health, local government, broadcasting, and university education.

Ernest Darwin Simon, who was born on October 9, 1879, was the son of Henry Simon who introduced into this country industrial processes which revolutionized flour milling and the production of coke ovens. Educated at Rugby and Pembroke College, Cambridge, Lord Simon was only 20 when his father died and he was called upon to take over great responsibility. In a relatively short time he was appointed chairman (later governing director) of the family business and its rapid expansion and prosperity was due to his inspiration and leadership. When he resigned as governing director of Simon-Carves, Limited, the Stockport engineering group, in 1954, he was appointed president of the company and two years later he resigned the chairmanship of Henry Simon (Holdings), Limited, and became president of that company.

It would be almost impossible to list his manifold interests, offices, and appointments outside the industrial sphere. He served as Lord Mayor of Manchester, Liberal Member for the Withington Division of Manchester, Parliamentary Secretary to the Ministry of Health, member of the Court and chairman of the Council of the University of Manchester, a member of the Advisory Council for Fuel and Power in the last war, and for five

years as chairman of the BBC. He was knighted in 1932 and elevated to the peerage in 1947.

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The death has occurred of Mr. CUTHBERT THURMAN formerly head of the firm of Henry Hirst & Sons, textile machinery valuers, of Leeds. He was 76.

The death has occurred of Mr. PERCY ROGERS, managing director of John Lowndes, Limited, coal merchants, of Shelton (Staffs). He was 66. At one time he was a mining surveyor at Kidsgrove.

The death has occurred of Mr. NORMAN JOSEPH BOOTH, head of the chemistry and metallurgy department of Chesterfield College of Technology. Before joining the college in 1935 he was assistant manager of the coke works of Altham Collieries, Limited.

The death took place on Tuesday of last week of Mr. WILLIAM OLIVER HUMPHREYS, coke-oven manager for the United Coke & Chemicals Company, Limited, branch of the United Steel Companies, Limited, at its Brookhouse coke and by-products plant at Beighton, for more than 40 years before he retired seven years ago. He was 83. He was a member and former chairman of the Midland area group of the Coke Oven Managers Association, and was a founder member, in 1915, of the Coke Oven Managers Association in Sheffield. He had an unbroken association with Beighton Miners Welfare Club and was its president for 27 years.

The death took place on Wednesday of last week of Mr. DOUGLAS DUNCAN KNEALE LEARY, manager of the Large Dense Medium Coal Preparation Plant at Wellesley Colliery, Buckhaven (Fife). Mr. Leary, who was 54, started work at 14 with the South Hetton Coal Company, Limited, and eventually became day shift enginewright of the company's Murton Colliery. In 1948 he was appointed mechanical engineer at Lambton "D" Colliery, No. 2 Area, Durham Division of the National Coal Board and in 1956 was transferred to Michael Colliery, East Fife Area, Scottish Division. Due to illness he relinquished his post as colliery chief mechanical engineer and last November took up the position as site engineer and later the post he occupied at his death. He was a member of the Fife branch of the Association of Mining Electrical and Mechanical Engineers.

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# World-wide Expansion Plans for Sandvik

WORLD-WIDE expansion programme is to be undertaken by the Sandvik Steelworks Company, Limited, which has about 30 subsidiary companies all over the world, including Sandvik Swedish Steels, Limited, Birmingham. At a Press conference in London on Tuesday, Disponent Wilhelm Haglund, president of the company, said that the group was preparing to set up new factories in Argentina, Brazil, and India, as well as a new £2,000,000 stainless steel tube extrusion plant in Sandviken—the company's home town in Sweden.

Disponent Haglund said that Sandvik was the second or third largest manufacturer of tungsten carbide in the world and aimed to be the largest in two or three years. To this end it is spending Rs. 12,000,000 (£900,000) on a plant in India to make tungsten carbide steels from the ore to the finished product in the form of mining and cutting tools with tungsten carbide tips. The group's turnover this year is estimated at about £30,000,000.

# *Installation of 325th Master Cutler*

FIRST Master Cutler to have come from Rotherham —Mr. Charles Henry Trelease Williams—was installed on Tuesday. Mr. Williams, who is the 325th to hold the office, is chairman of the Park Gate Iron & Steel Company, Limited, managing director of the Renishaw Iron Company, Limited, and a director of the Byfield Ironstone Company, Limited, Round Oak Steel Works, Limited, and Tube Investments, Limited.

He joined Park Gate Iron & Steel as an apprentice earning 7s. a week and is the fourth generation of his family to have spent his working life in the heavy steel industry. Since 1952 he has been chairman of the training committee of the British Iron and Steel Federation and is a member of its council and executive committee. Mr. Williams succeeds as Master Cutler, Mr. P. J. C. Bovill, managing director of Newton, Chambers & Company, Limited, near Thorncliffe, Sheffield.

Acknowledging his installation, Mr. Williams said that the iron and steel making plants, forming Sheffield's largest single industry, were fully employed and, unless there was a serious and prolonged contraction in demand from the motor vehicle industry, production should continue at a high level for many months ahead. Competition, already strong from the Continent and the Far East, had in recent months been intensified by American interest in Britain's markets. Heavy forgings, exceptionally busy up to 12 months ago, were now running below capacity.

It was a mark of confidence, he maintained, that already in Hallamshire, in the steel industry alone, plans for capital development had been announced involving a total expenditure of more than £40,000,000 and a project of even greater dimensions was under study. "We must have faith in our ability to maintain our rate of industrial development and the resultant improvement in living standards," he declared.

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# W. G. Allen Hopes to "Break Even"

IN the current financial year the directors of W. G. Allen & Sons (Tipton), Limited, colliery, light railway, and mechanical engineers, hope that the group will "break even." The business suffered a set-back in the year ended March 31, 1960. Due to labour difficulties, it must be accepted, states Mr. Robert Hampshire, the chairman, that the parent company will operate at a lower level of activity than during peak years. He expects that it will still show a trading loss in the current financial year, although he believes that this will be considerably offset by the profits of the subsidiaries.

Orders had to be taken at little or no profit margin and the total of employees was reduced by some 25 per cent. There are signs, however, that the labour force will be built up over the next few months. The production of mining equipment at the main Tipton (Staffs) works has been hit by the coal recession and the development of new products has been accelerated.

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SPEAR & JACKSON, LIMITED, Sheffield, has brought into production a new saw handle factory to replace the works destroyed by fire four months ago.

PROF. D. WILLIAMS, D.Sc., Ph.D., B.Eng., D.I.C.

## PROF. DAVID WILLIAMS, D.Sc., Ph.D., B.Eng., D.I.C.

PRESIDENT of the Institution of Mining and Metallurgy for 1960-61, Prof. David Williams occupies the University of London Chair of Mining Geology at the Imperial College of Science and Technology.

Following service in the 1914-18 war, Prof. Williams entered the University of Liverpool in 1918, gaining honours degrees in civil engineering in 1921 and in geology in 1922. In 1923 he was awarded M.Sc. in geology and three years later the degree of Ph.D. (Liverpool) and the Diploma of the Imperial College for his geological researches in Snowdonia. After two seasons in Northern Rhodesia, mainly on geophysical prospecting, and a few months' exploration work for the Tigon Mining Corporation in Almería, Spain, he became mining geologist at the Rio Tinto Mines, Spain.

In 1932, Prof. Williams began his teaching career at the Imperial College. He became a Reader in 1947 and Professor of Mining Geology and Head of the Department of Geology in 1950. Last September he relinquished the office of Dean of the Royal School of Mines, after serving in that capacity since 1952. He has travelled widely on geological missions and his advice as a consulting geologist has been sought by various companies and official organizations, while he still retains his association with Rio Tinto.

Prof. Williams has given long service to the Geological Society of London, as a member of council and vice-president, including nine years as secretary, and was awarded the Lyell Medal of the society last year. He was centenary president of the Geologists' Association for 1958-60. He served for several years on the council of the Mineralogical Society. Author of many publications on pure and applied geology, he is joint author with Prof. W. R. Jones of "Minerals and Mineral Deposits." For "The Geology of the Rio Tinto Mines, Spain," published in the Transactions of the Institution of Mining and Metallurgy, Prof. Williams was awarded the gold medal for 1934 of the Consolidated Gold Fields of South Africa, Limited.

*To face page 776*

# SUPPORT OF COAL FACES in the East Midlands

## PART 1: *Application of Hydraulic Props and Composite Hydraulic Supports*

By C. ROUND, M.I.Min.E.*

*In this paper, presented to the Midland Branch of the National Association of Colliery Managers on March 14, 1960, the author describes the types of hydraulic props and composite hydraulic supports in use in No. 4 Area of the East Midlands Divisional Coal Board, where 62.1 per cent. of the output is mechanically mined. The problems associated with the maintenance of roof supports are discussed. The cost of hydraulic prop installations and the expenditure on powered supports are outlined in the second part of the paper, which will appear in our next issue.*

SUCCESSFUL coal-face mechanization has been greatly facilitated by the use and development of the hydraulic support. Many valuable contributions to such development have been made by the mining engineer and the manufacturer, upon which a number of excellent papers have been published.

During the past few years coal-face mechanization has been increasing at an appreciable rate. New problems, chiefly concerned with roof control and the economic utilization of men, machines, and materials, have been encountered. The resolution of these problems has stimulated the further development and application of the hydraulic support. The No. 4 (Alfreton) Area of the East Midlands Divisional Coal Board has been particularly active in this direction, and it is with the object of trying to assess and analyze the experience to date that this paper is presented.

### The Alfreton Area

No. 4 (Alfreton) Area, approximately 65 sq. miles in area, lies adjacent to and immediately to the west of Mansfield in Nottinghamshire. It embraces part of both the Nottinghamshire and Derbyshire coalfields. The western boundary is fixed by outcrops, while the other boundaries, north, east, and south, are fixed with the adjoining Areas, Nos. 1, 3, and 5, and No. 6, respectively.

Eighteen collieries, which produce about 180,000 (saleable) ton/week, are in operation. A wide variety of physical conditions exist within the Area, and the weighted average section of all seams at present being worked is 3 ft. 3 in. Standard pit top and pit bottom compact mine-car circuits are in use at most collieries. Gravity is used for the movement of the mine cars, control being effected by Lofco feeders and turntables. Underground coal transport is by conveyors, loading points being situated adjacent to the pit-bottom circuits. In three cases, the coal is transferred to the surface via drifts, in which conveyors are installed.

The Area is extensively mechanized, 62.1 per cent., or an average of 110,000 saleable tons weekly of the total output being power loaded. A wide range of power loaders, shearers, trepanners, ploughs, flight loaders, double-turret jibs, etc., are in use.

### THE HYDRAULIC PROP

#### Types in Use

Many types of hydraulic props have been used or are still in use. These include both the Dowty and Dobson range of props, and, more recently, the Polar hydraulic prop has been introduced. Table 1 gives details of the props in use, issued, maintained, lost, and scrapped during 1959.

Both the Dowty and Dobson hydraulic props have proved equally reliable in service, and there is little to add to the extensive national experience already acquired.

More recent and important developments in

TABLE 1.—*Hydraulic Props in Use during* 1959.

| Type. | No. in use Dec. 31, 1958. | New issues during 1959. | No. lost during 1959. | No. in use Jan. 1, 1960. | Central shop serviced in 1959. |
|---|---|---|---|---|---|
| *Dowty* | | | | | |
| P.A. 2700 .. | 19,766 | 577 | 3,108 | 17,235 | 11,063 |
| Monarch .. | 29,053 | 1,632 | 7,304 | 23,381 | 10,087 |
| Duke .. | 48 | 7,307 | 1,057 | 6,298 | — |
| *Dobson* .. | 10,672 | 4,381 | 2,827 | 12,226 | 6,187 |
| *Polar* .. .. | — | 580 | — | 580 | — |
| Total .. | 59,539 | 14,477 | 14,296 | 59,720 | 27,337 |

* General manager, No. 9 Area, South-Western Divisional Coal Board.

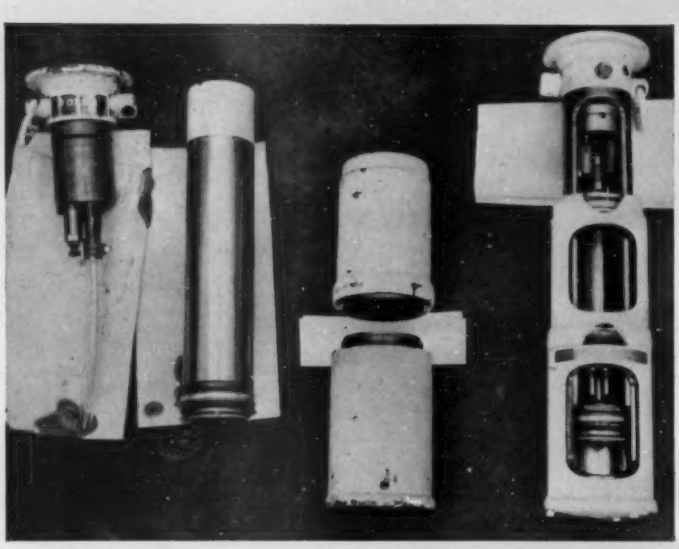

FIG. 1.—COMPONENT PARTS COMPRISING THE POLAR PROP.

connection with the hydraulic prop are incorporated in the Polar prop, which has been designed to facilitate easy maintenance and transport. Fig. 1 shows the prop with some of the outer casing cut away, and also the unit components unassembled.

The prop has a straight line yield characteristic, and is intended to carry 20 tons with an initial setting load of 7 tons. The main feature is the "head" unit, which houses the setting pump, setting control valve, two-stage release mechanism, air breather, automatic air valve, comprising 70 per cent. of the total components used in the prop. The "head" unit weighs 15 lb., is easily transportable, and its replacement at the coal face can be effected within 3 min. A trial installation was introduced into the Deep Soft Seam at Annesley Colliery in October, 1959. Fig. 2 shows part of the face chosen in the Deep Soft Seam.

Basic systems of support have been developed to meet the specific needs of the mechanized power-loading systems in use.

Face-support systems are modified to suit local needs by the introduction of rigid and hydraulic chocks, packs, or both, where necessary. Generally, these have proved satisfactory, but serious failures have occurred which have disorganized operations with heavy losses of production. The basic causes of these failures have been the failure to control excessive prop losses and unsatisfactory *in situ* prop maintenance.

### Hydraulic Prop Losses

Prop losses have proved the most costly and difficult problem experienced in No. 4 Area. Losses in 1959 were 14,296 props, at an estimated value of £183,000. This experience, it is understood, is not confined to No. 4 Area, but is a general one of real magnitude. Reasons given for losses are broadly classified under five main headings—waste flushing 38 per cent., faulted, disturbed, and wet strata 30 per cent., roof falls 19 per cent., major weights 9 per cent., and miscellaneous 4 per cent.

It is more than probable that certain deliberate losses, such as burying in the packs, are included in these figures. An objective analysis would appear to suggest that losses can be reduced by improved support densities, greater waste-edge support, and more care during recovery operations.

The importance of providing and using adequate administrative control, including accurate recording systems, is greatly stressed. Lack of such control or the use of inaccurate records can, and does, have serious consequences. Insidious prop losses

FIG. 2.—SECTION OF FACE IN THE DEEP SOFT SEAM AT ANNESLEY COLLIERY SUPPORTED BY POLAR PROPS.

TABLE 2.—*Hydraulic Prop Record for Week Ended December 12, 1959.*

| Colliery. | No. issued. New. (1) | No. issued. Others. (1) | Sent for repair. (2) | Scrapped. (3) | Lost. (4) | Held at end of week. (5) | In use at end of week. (6) | Item 4 as percentage of item 6. (7) |
|---|---|---|---|---|---|---|---|---|
| Alfreton .. .. .. | — | 44 | 49 | — | — | 1,248 | 1,158 | — |
| Annesley .. .. .. | — | — | — | — | 3 | 4,662 | 4,482 | 0.06 |
| "A" Winning .. .. .. | 150 | 31 | 70 | — | 13 | 5,368 | 4,994 | 0.26 |
| Bentinck .. .. .. | — | 25 | 18 | — | 21 | 4,450 | 4,352 | 0.44 |
| Brookhill .. .. .. | — | 66 | 30 | — | 27 | 6,247 | 6,247 | 0.43 |
| "B" Winning .. .. .. | — | 51 | — | — | 4 | 2,110 | 2,058 | 0.19 |
| Cotes Park .. .. .. | — | — | 34 | — | — | 195 | 195 | — |
| Kirkby .. .. .. .. | 35 | 49 | 71 | — | 44 | 8,637 | 8,600 | 0.51 |
| Langton .. .. .. .. | — | — | — | — | 1 | 3,104 | 3,104 | 0.03 |
| New Hucknall .. .. .. | — | 28 | 28 | — | — | 1,305 | 1,276 | — |
| Newstead .. .. .. | — | 12 | 58 | — | 48 | 4,754 | 4,459 | 0.96 |
| Pleasley .. .. .. | — | 36 | 51 | — | 4 | 4,704 | 4,704 | 0.08 |
| Shirland .. .. .. | — | — | — | — | — | 281 | 196 | — |
| Silverhill .. .. .. | — | — | — | — | 8 | 5,049 | 4,790 | 0.16 |
| Sutton .. .. .. .. | — | 27 | 27 | — | 9 | 2,241 | 2,100 | 0.42 |
| Swanwick .. .. .. | 100 | 36 | — | — | 42 | 3,324 | 3,299 | 1.27 |
| Teversal .. .. .. | — | — | — | — | 5 | 1,119 | 881 | 0.56 |
| Wingfield M. .. .. .. | — | — | — | — | — | 356 | 321 | — |
| Area total .. .. | 285 | 405 | 436 | — | 224 | 59,154 | 57,218 | 0.39 |

NOTE: Column 1 includes those returned to collieries after repair by workshops or manufacturers.

pass unnoticed, support densities are reduced, roof control deteriorates, falls of roof occur, losses are further increased, and a vicious spiral is set up. Apart from the major aspect of safety involved, valuable equipment is lost, and production may be disrupted for days, or even weeks, at great expense.

Control systems have been developed with some success. Detailed shift counts, zonal prop identification, and the introduction of intensive supervision are among the measures introduced. Table 2 represents the standard weekly control record in use.

Though a great deal more can be done to keep the problems within more satisfactory limits, such factors as physical conditions and roof control techniques involved cannot be ignored. It is considered that the use of composite supports as opposed to individual props is fundamental to the real solution.

### Hydraulic Prop Maintenance

In view of the precise nature of its design and construction, the loads and forces to which it is subjected, and the serious abuse it often receives, maintenance of the hydraulic prop constitutes a most important aspect of its use.

Maintenance is carried out in two separate though complementary stages:—

(1) Colliery or *in situ* maintenance in which topping up with hydraulic oil, replacement of caps, bar location heads, extension pieces, "D" links, base plates, etc., is carried out at the face without having to dismantle or split the prop.

(2) Central workshop maintenance, in which case the props are withdrawn from their location and are transported to the "B" Winning Dowty repair shops, where they are subject to major overhaul and thorough test prior to being returned to the colliery.

The comparative efficiency and care with which *in situ* minor repairs and servicing are carried out influences the cost of central workshop maintenance.

Between March, 1957, and December, 1959, over 68,750 props have been repaired. During the year 1959, an average total of 59,630 props were in use of which 27,337 were repaired at the shops.

Staff at the central workshops comprises 21

FIG. 3.—A SECTION OF A TREPANNER FACE SUPPORTED BY DOWTY DUKE HYDRAULIC PROPS.

men, and a productivity of seven props repaired and serviced per manshift is obtained. The average cost per prop of all types repaired during 1959 was 28s. 5d., inclusive of labour, materials, and fixed charges.

Table 3 provides interesting details of the maintenance costs for each type.

The Duke prop, despite its comparatively short period of use, has proved satisfactory. It is easy and quick to operate, is no less reliable than its predecessors and incorporates experience gained over many years. At the moment it is not possible to assess its maintenance potentialities. Early indications are promising. Fig. 3 shows a number of these props in use.

The Polar prop was introduced during the development of one of the main production panels, and it is only recently that this panel has commenced full production; consequently, it is not possible at this stage to indicate its potentialities.

With greater colliery attention to such practices as allowing props to become solid or overloaded, abuse by hammer blows, use of improper sizes, and open storage in exposed conditions, repair costs can be reduced.

### Handling, Transport, *in situ* Maintenance, and Checking

The total number of props in stock, in transit, and under repair at any time is about 2,600, the approximate value being £27,000. During 1959 more than 70,000 props were handled within the Area for the purposes of maintenance and replacement.

*In situ* maintenance is undertaken by 26 men, assisted in some cases by steel checkers; physical checks are carried out by 78 men. As part of their general duties, materials control officers and supports economy officers are actively engaged in the control and use of supports.

### Summarized Expenditure of Hydraulic Prop Installations

The percentage of mechanized output in 1959 was 60.9, about 0.4 per cent. less than in 1958. Hydraulic prop purchases were 14,780 at a cost of £190,000. Link-bar purchases were 14,000 at a cost of £82,600. The total purchases for the purpose of extending and maintaining mechanized systems were £272,600. Central workshop maintenance, as shown in Table 3 was £38,869.

Wastage of hydraulic props was 14,296 at an estimated value of £184,000. Wastage of link bars was 13,380 at an estimated value of £83,625. The total cost for replacing wastage, maintenance, handling, and checking of hydraulic props and link bars during 1959 is estimated at £350,000 or 1s. 4.3d./ton of mechanized output. Continued attempts are being made to reduce this expenditure, and it is felt to be a most important aspect in strengthening the competitive position of coal in the national economy.

In view of the problems outlined, some two years or so ago the advent of the powered support was considered as a measure which might be adopted to improve roof control techniques, reduce manpower, increase total productivity, reduce production costs, and solve many of the difficulties described.

In August, 1957, Gullick chocks were introduced into the Blackshale Seam at "A" Winning Colliery, for the purpose of gaining the experience needed.

## THE COMPOSITE HYDRAULIC SUPPORT

In March, 1950, the late Mr. T. D. Watson, then manager of Clipstone Colliery devised, a simple composite support*, which consisted of two Dowty hydraulic supports, mounted at 4-ft. centres in an 8-in. by 3-in. channel base and carrying a similar channel-type bar. These units were used in pairs at intervals of 4 ft. This constituted a major pioneering step and was probably the forerunner of the present powered support systems.

### Types of Powered Supports in Use

Both the Gullick Seaman self-advancing support and the Dobson "Double-Two" self-advancing support have been firmly established as proven powered supports. Further development is being undertaken with other types—Dowty "Roofmaster Minors," Hudswell Clarke, and Desford hydraulic chocks. Table 4 indicates the general position of the application of self-advancing supports within the Area.

These supports have been apllied under a wide range of physical conditions, both as a measure to increase the support density of existing systems and as complete propless installations.

It is considered that the powered support has proved its technical superiority over conventional

* Trans. Inst. Min. Engrs., Vol. 116, page 636.

TABLE 3.—*Adjustable Supports Repair Workshop. Cost of Adjustable Supports Repaired During 52 Weeks Ended January 2, 1960.*

| | Dowty Monarch. | | Dowty P.A.2700. | | Dobson. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| No. of supports repaired .. | 10,087 | | 11,063 | | 6,187 | | 27,337 | |
| | Amount. | Per support. | Amount. | Per support. | Amount. | Per support. | Amount. | Per support. |
| | £ | s. d. | £ | s. d. | £ | s. d. | £ | s. d. |
| Direct wages .. .. .. | 2,264 | 4 5.9 | 3,448 | 6 2.8 | 1,201 | 3 10.6 | 6,913 | 5 0.7 |
| Direct materials .. .. | 12,641 | 25 0.7 | 4,082 | 7 4.5 | 8,429 | 27 3.0 | 25,152 | 18 4.8 |
| Overheads .. .. .. | 2,232 | 4 5.1 | 3,388 | 6 1.5 | 1,184 | 3 9.9 | 6,804 | 4 11.7 |
| Totals .. .. .. | 17,137 | 33 11.7 | 10,918 | 19 8.8 | 10,814 | 34 11.5 | 38,869 | 28 5.2 |

TABLE 4.—*Powered Supports in Use in No. 4 Area, East Midlands Division.*

| Colliery. | Powered support type. | Seam. | Total face length, yd. | No. of units. | Remarks. |
|---|---|---|---|---|---|
| Alfreton .. .. | Gullick | Blackshale | 140 | 59 | Mixed system—hydraulic props, link bars, and strip packs |
| "A" Winning .. .. | Gullick | Blackshale | 862 | 165 | Mixed system—hydraulic props, link bars, and strip packs |
| Bentinck .. .. | Gullick | Low Main | 617 | 232 | Hydraulic props, link bars, caving |
| Brookhill .. .. | Gullick | Blackshale | 359 | 172 | Hydraulic props, link bars, caving |
| Kirkby .. .. .. | Gullick | High M.39s | 167 | 52 | Hydraulic props, link bars, caving |
| | | High M.40s | 247 | 55 | |
| | | Deep S.70s | 192 | 60 | Hydraulic props, link bars, and strip packs |
| Langton .. .. | Gullick | Blackshale N.8s | 220 | 48 | Hydraulic props, link bars, and strip packs |
| | | Blackshale N.7s | 180 | 48 | |
| Newstead .. .. | Gullick | High Main | 808 | 356 | Hydraulic props, link bars, and strip packs |
| Pleasley .. .. | Gullick | Deep Hard | 886 | 357 | Hydraulic props, link bars, and caving |
| Silverhill .. .. | Gullick | Deep Hard | 198 | 118 | Hydraulic props, link bars, and caving |
| | | Low Main | 186 | 112 | |
| Swanwick .. .. | Gullick | Blackshale | 380 | 167 | Propless face, strip packs. Other faces hydraulic props, link bars, and strip packs |
| Newstead .. .. | Dobson | High Main | 230 | 150 | Propless caving |
| Teversal .. .. | Dobson | Waterloo | 184 | 138 | Propless caving |
| Bentinck .. .. | Dowty Roofmaster | Low Main | 8 | 6 | Development prototype |
| Teversal .. .. | Hudswell Clarke | Waterloo | 8 | 6 | Development prototype |
| "A" Winning .. .. | Desford | Blackshale | — | 4 | Development prototype |
| Totals .. .. | .. .. | .. .. | 5,872 | 2,305 | |

forms and, with the continuance of present mining techniques, will contribute greatly to increased efficiency. It has been found possible, by the use of the composite hydraulic support, to maintain working conditions and regular production in circumstances where other systems have failed.

Where floor dirt is extracted within the working section to provide a stable foundation for conventional supports, coal qualities, especially untreated smalls, are adversely affected. Powered supports are being used in such circumstances, but on the natural floor of the seam, and coal qualities are greatly improved. Experience gained with the various supports and their associated systems is recorded as follows:—

### Gullick Seaman Self-advancing Support

Reference has already been made to the introduction of the first powered support installation in August, 1957. This was a complete propless installation on an Anderton shearer loader face 220 yd. in length, fully caved.

Many difficulties and disappointments were encountered. These difficulties arose from the inability to secure full contact between the cantilever bars and the roof, heavy "weights" being transferred over the conveyor track, and excessive floor lift. Major roof breaks formed adjacent to the coal face and falls to face occurred. In view of the reduced working height created, it was necessary to dint beneath and rip over the chocks in order to advance and establish them on the forward side of the breaks. It was frequently necessary to advance the supports beneath extensive cavities which were difficult to support.

In the difficult conditions which prevailed, chock bases and canopies were badly damaged. Bars were repeatedly bent or destroyed and further design and development work was found to be necessary. Chocks bases and canopies were greatly stiffened, heavier steel plate used and the chock weight increased by 2.34 cwt.

Fig. 4 shows the chock as strengthened and modified in the light of the experience gained.

The difficulties outlined were overcome as follow:—

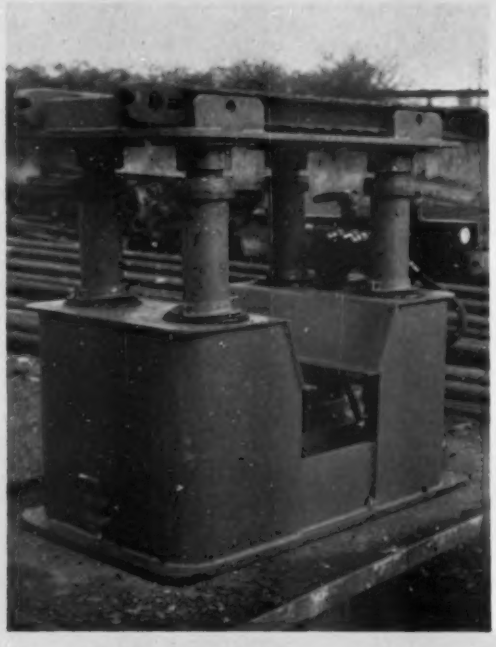

FIG. 4.—MODIFIED GULLICK SEAMAN SELF-ADVANCING SUPPORT.

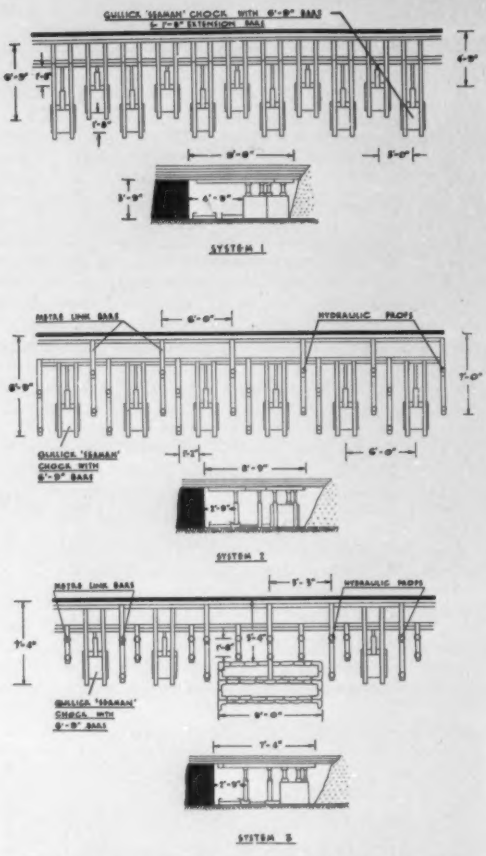


FIG. 5.—DEVELOPMENT OF THE GULLICK SUPPORT SYSTEM ON AN ANDERTON SHEARER FACE IN THE BLACKSHALE SEAM.

(1) Link bars and hydraulic props were introduced with the modified chocks.

(2) Intermediate waste packs 3 yd. wide, at intervals of up to 21 yd., were built.

Fig. 5 shows the progressive stages as roof control evolved and the progress achieved is recorded in Table 5.

By May, 1958, reasonable progress had been made and further development at other collieries was undertaken. Generally, any success achieved by using the form of support in the manner indicated arises from increased support densities more effectively provided. The problems associated with rigid steel chocks, such as lack of pre-loading facilities, short-time intervals between withdrawal, advance, and resetting, improper setting, and manhandling, are well known. In certain cases these have been found to be one of the root causes of major difficulties.

A useful development of the Gullick Seaman chock has arisen out of the resolution of a difficult problem of floor penetration in the Blackshale Seam at Swanwick Colliery. For many months, heavy tonnage losses took place and redevelopment of the faces was a regular feature. A number of measures were tried, such as the use of different types of prop base, increased pack widths, and reduced pack intervals and shorter face lengths, but with little success. The difficulty was finally overcome by fitting an extension 3 ft. by 2 ft.* to the hydraulic chock bases and upon which the forward props adjacent to the panzer conveyor are mounted.

This extension base is fitted *in situ*, requires no drilling or bolts, and provides for some degree of articulation. Since its introduction in October, 1959, continuity of production has been achieved. The average weekly tonnage on the main production unit has increased from 620 to 1,950, the coal face productivity having improved from 54.6 cwt. to 117.4 cwt. per manshift.

Fig. 6 shows a section of this particular face equipped with extended base plates upon which the forward hydraulic props are mounted.

Fig. 7 is a similar section of the same face in which the hydraulic props have been replaced by power-operated jacks.

To facilitate *in situ* maintenance, the chock has been redesigned by Herbert Cotterill, Limited, such that the individual legs can be replaced through the sides of the chock while it is partly under load. Fig. 8 shows the Cotterill chock, equipped with Gullick hydraulics and fitted with the extended base plate.

Fig. 9 shows the system of support adopted in connection with Cotterill chocks equipped with extended bases and powered forward legs. These Cotterill chocks are being used successfully at Silverhill Colliery for the purpose of enabling the support system to work on the natural floor of the Deep Hard Seam, so avoiding the extraction of dirt within the working section. The quality of the untreated fines ($\frac{3}{4}$-in. to 0) has improved from an ash content of 31.8 per cent. to one of 24.8 per cent. with an increase of 14s. per ton revenue.

* Designed by Mr. J. A. Wright, deputy production manager (operations), No. 4 Area, East Midlands Divisional Coal Board.

TABLE 5.—*Progressive Stages of Roof Control.*

| Stages as per Fig. 5. | Period. | | Manpower. | | Average shears/ shift. | Average weekly tonnage. | O.m.s. (tons). |
|---|---|---|---|---|---|---|---|
| | From | To | Supports. | Total. | | | |
| 1 | Aug., '57 .. | Nov., '57 .. | 6 | 16 | 1.37 | 1,155 | 5.52 |
| 2 | Nov., '57 .. | Jan., '58 .. | 8 | 18 | 1.91 | 1,870 | 7.08 |
| 3 | Jan., '58 .. | Oct., '58 .. | 10 | 20 | 2.50 | 2,640 | 9.16 |

FIG. 6.—A SECTION OF A FACE IN THE BLACKSHALE SEAM AT SWANWICK COLLIERY EQUIPPED WITH GULLICK SEAMAN SELF-ADVANCING CHOCKS WITH AN EXTENDED BASE PLATE IN WHICH DOBSON HYDRAULIC PROPS ARE MOUNTED.

Similar problems of coal quality deterioration have been met at Pleasley Colliery on an Anderton shearer loader face. It has been found possible to lift the support system upwards of 12 in. on to the natural floor of the Deep Hard Seam and avoid the extraction of floor dirt in the working section.

The power cables and hydraulic lines are being carried by the chocks experimentally as a means of protection. At the present time, a total of 2,001 Gullick and Cotterill units are in use. More than 650 are fitted with extended base plates.

### Dobson "Double-Two" Self-advancing Support

During and prior to August, 1958, difficult problems of roof control were encountered in the High Main Seam at Newstead Colliery. Production was badly disorganized, costs of production increased, and coal qualities deteriorated. An installation of Dobson self-advancing supports was introduced at one of the main mechanized production faces as one of the measures designed to deal with the situation.

This face was 260 yd. in length, the seam section about 4 ft. 2 in., and the working section 3 ft. 8 in.

Physical conditions are of an inferior nature. The seam is overlain by a bed of laminated shale, the first few feet of which are particularly weak and contain a number of slips and irregularities.

About 6 in. of top coal have to be left to form a roof. The floor is a soft mudstone into which the conventional hydraulic supports penetrate up to a depth of more than 6 in.

Being the first installation of its type, it was not introduced hurriedly. Modifications dictated by experience were incorporated into each batch of supports introduced. The period of installation covered about four months and was completed in December, 1958.

Details of the support units are shown in Fig. 10, each of which embraces a number of important features:—

(*a*) Large base area of 10.03 sq. ft.

(*b*) Pre-loading of cantilever bars with provision for a vertical 6½ deg. angular movement above and below the horizontal line. Full contact is established in normal circumstances over the length of the bar.

FIG. 7.—A SIMILAR SECTION OF THE SAME FACE AT SWANWICK COLLIERY IN WHICH THE HYDRAULIC PROPS HAVE BEEN REPLACED BY POWER-OPERATED JACKS.

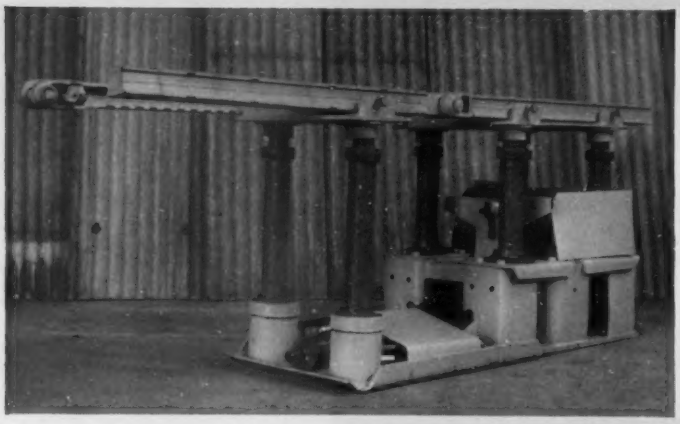

FIG. 8.—THE COTTERILL CHOCK FITTED WITH THE EXTENDED BASE PLATE AND INCORPORATING THE GULLICK HYDRAULIC SYSTEM.

(*c*) Setting loads can be intensified (50 tons per unit) up to full load pressure.

(*d*) Part of the load is held by either the "master" or the "slave" components as the supports are advanced.

Total caving has been established successfully. The roof canopies were extended slightly into the waste to avoid heavy flushing burying the back end of the supports. To speed up setting and advancing operations and reduce resistance in both the supply and return pressure lines hose diameters were increased from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. dia. (supply line) and $\frac{1}{2}$ in. to 1 in. dia. (return line).

Since all legs operate on a common hydraulic pressure system, anxiety was expressed relative to the waste breaking over the supports between the front and back legs. It was felt that the back legs would extend into the crushed roof and the front legs would lose their support characteristics. This difficulty was never experienced, although tests were carried out with the front and back legs on a separate pressure system. Due to the loss of intensification on the back legs with no material benefits this arrangement was discontinued.

A second complete installation was introduced

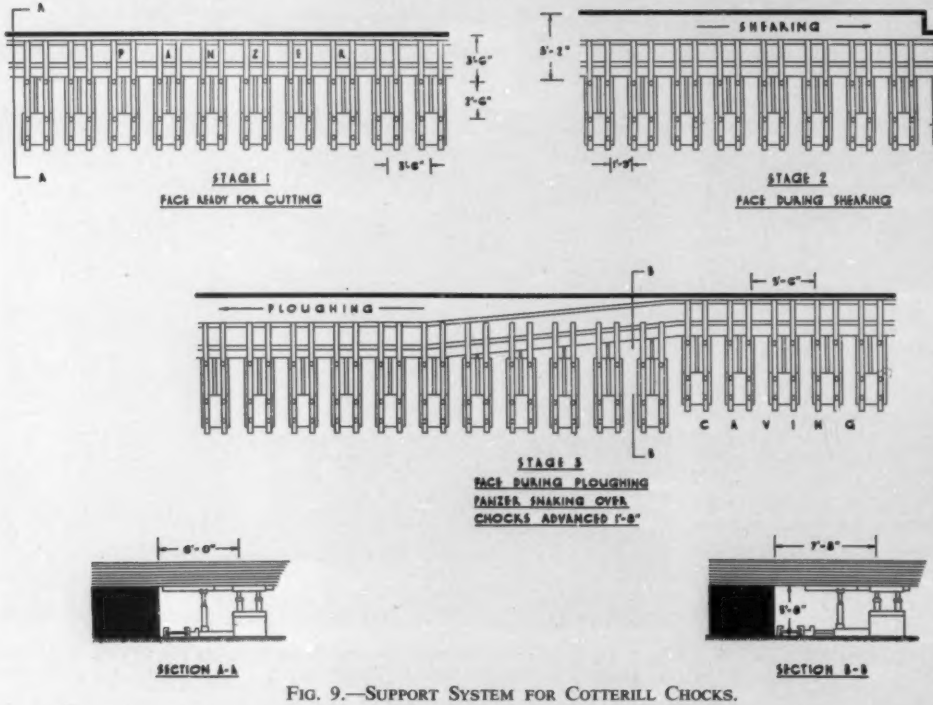


FIG. 9.—SUPPORT SYSTEM FOR COTTERILL CHOCKS.

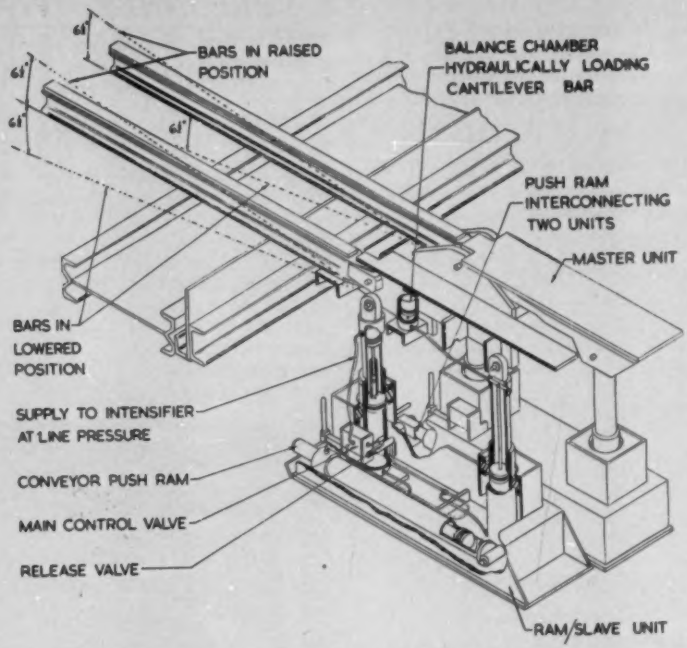


FIG. 10.—DETAILS OF THE DOBSON "DOUBLE-TWO" SUPPORT UNIT.

into the Waterloo Seam at Teversal Colliery. The face was 260 yd. in length, having a working section of 3 ft. 4 in. It was necessary to leave some 6 to 8 in. of coal top to support the immediate roof which consisted of a friable bind. Some 32 ft. above the seam, the Dunsil Seam had been worked and a number of old roads and narrow pillars created difficult conditions of interaction.

Fig. 11 shows a section of the face. The "Double-Two" master units have been advanced

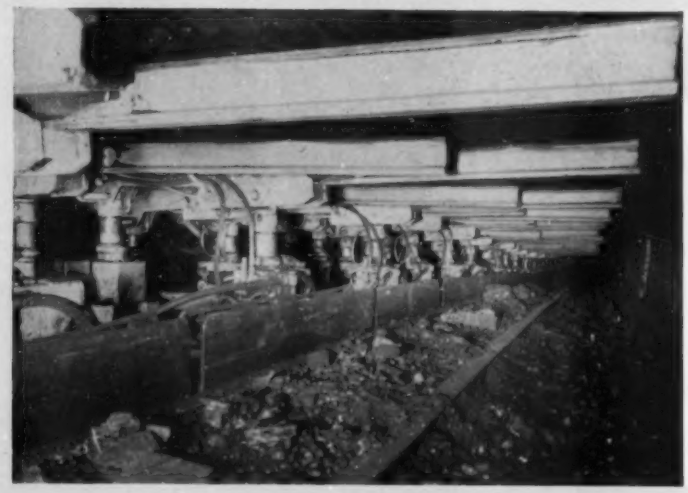

FIG. 11.—"DOUBLE-TWO" SELF-ADVANCING SUPPORTS AT TEVERSAL COLLIERY, THE MASTER UNITS BEING ADVANCED TO SUPPORT THE SHEARED TRACK.

to support the sheared track. This installation has operated some 14 months and no difficulties have been met.

Table 6 sets out comparative manpower details for the installations at Newstead and Teversal collieries.

TABLE 6.—*Manpower Comparison between Dobson "Double-Two" Supports at Newstead and Teversal Collieries.*

| Occupation. | Newstead—South 4s High Main Seam. | | | Teversal 1s Waterloo Seam. | | |
|---|---|---|---|---|---|---|
| | Manpower /shift. | | | Manpower/shift. | | |
| | Hydraulic props and link bars. | Double Twos. | Saving. | Hydraulic props and link bars. | Double Twos. | Saving. |
| Rippers .. | 7 | 7 | — | 8 | 8 | — |
| Face switches | 1 | 1 | — | 1 | 1 | — |
| Shotfirers | 1 | 1 | — | 1 | 1 | — |
| Stableholes | 8 | 8 | — | 9 | 9 | — |
| Machine men and chargemen .. | 3 | 3 | — | 3 | 3 | — |
| Support lengths | 16 | 8 | — 8 | 16 | 6 | —10 |
| Maintenance | — | 1 | + 1 | — | 1 | + 1 |
| Total .. | 36 | 29 | 7 | 38 | 29 | 9 |

(*To be continued*)

# *US Report on Dust Explosion Testing*

STANDARD laboratory tests of dust explosibility, developed over the years by the Bureau of Mines, are described in Report of Investigations 5624. "Laboratory Equipment and Test Procedures for Evaluating Explosibility of Dusts," published by the US Department of the Interior. The report, of interest to a wide variety of research laboratories and industrial plants, is aimed at promoting a better understanding of the bureau's testing methods so its findings regarding industrial dusts will be more useful in lessening the hazards of explosions.

Since the bureau's establishment in 1910, much of its research regarding the explosibility of dusts has centred on coal dust. A brief historical summary of this is included in the illustrated report. New metals, plastics, and techniques for processing foods have created new safety problems and the bureau's explosion-research teams have tested a wide range of metallic and non-metallic dusts, including agricultural products, and determined their explosibility. The bureau's report describes its procedures for handling a dust sample, from its receipt at its laboratories through all tests until sufficient facts are obtained for preparing a formal report regarding characteristics of the specimen.

Copies of the report may be obtained from the Publications-Distribution Section, Bureau of Mines, 4800, Forbes Avenue, Pittsburgh 13, Pa.

## *TREPANNER OPERATION*

# Made Safer with New Sprag

MR. W. MURDAY, Group manager, and Mr. A. A. Grainger, Group mechanical engineer, in No. 5 Area of the East Midlands Divisional Coal Board, have designed a device claimed to overcome the difficulty and danger in the operation of trepanners caused by slines of pre-cut coal rolling off the face.

Trepanner working has always necessitated one or more men to clean spillage behind the power loader before the panzer is snaked over, and it is these workers who encounter the greatest

THE ORMONDE SPRAG INSTALLED.

hazard from falling slines. A further operating difficulty arises if coal slines fall before the panzer has been completely snaked, as they have to be cleaned up before snaking can be completed.

This simple sprag, called the Ormonde, which weighs only 32 lb., was devised to overcome these problems. As shown in the accompanying illustration, a saddle bracket rests on the collar of the nearest hydraulic prop. An extendable stretcher is pivoted on this bracket, while at the other end of the stretcher is a pivoted shoe, 2 ft. long, which makes direct contact with the coal face. A small number of such sprags enable spillage cleaning and snaking to be completed safely and efficiently. The short and long parts of the stretcher are drilled to enable any adjustment to be made as required.

A PRIVATE EXHIBITION of Nife portable safety lamps will be held at More's Hotel, India Street, Glasgow, C.2, from October 31 to November 3. The exhibition will be open from 10 a.m. to 6 p.m.

# RESEARCH ON STEEL

## *Features of BISRA's Annual Report*

*An immense range of activities and an expenditure of nearly £800,000 (of which approximately £73,000 was on plant and equipment) are recorded in the annual report for 1959 of the British Iron and Steel Research Association. As the production of finished steel last year was over 15,000,000 tons, worth, on average, £40 per ton, BISRA's research expenditure represents about one eighth of 1 per cent. of the value of the steel made.*

ONE must not assume, of course, that this low figure of one eighth of 1 per cent. represents the whole of Britain's steel research. It would be a sad reflection on our industry if it did. In addition to contributing the greater part of BISRA's income—the Government grant is £120,000—many of the member firms spend enormous sums on research within their own organizations.

Notes on some of the vital researches of BISRA are given below. Copies of the annual report may be obtained from the British Iron and Steel Research Association, 11, Park Lane, London, W.1.

### IRONMAKING

*Blast-furnace Chemistry.*—A unique method of studying the processes that occur inside the blast furnace is now in progress in the special apparatus, SCICE (stationary charge in controlled environment). In this apparatus full-size blast-furnace materials are subjected to the conditions experienced by a normal charge during its passage down a blast-furnace stack. The materials remain stationary and gas of controlled composition and temperature is circulated through them in a closed system (see Fig. 1).

*Sintering.*—Sinter box experiments on home ores have shown that the use of preheat up to 600 deg. C. gives proportionate savings in coke, but higher temperatures show diminishing returns. A study of the effect of gas/air ratio during ignition on the strength of the sinter in the top layer of the bed has shown that the strongest sinter is produced when a quantity of air slightly in excess of that needed for gaseous combustion is used and the waste gas flow is just sufficient to draw the gases from the bed.

Many other studies of sintering are in progress, such as the relation of sintering temperature to the strength of fluxed sinters, the substitution of solid fuel by gaseous fuel, and the effect of return fines on the sintering process.

*Ore Preparation.*—Concentration tests on marginal Northamptonshire ironstone have shown that roasting in a reducing atmosphere followed by grinding and magnetic separation will yield a con-

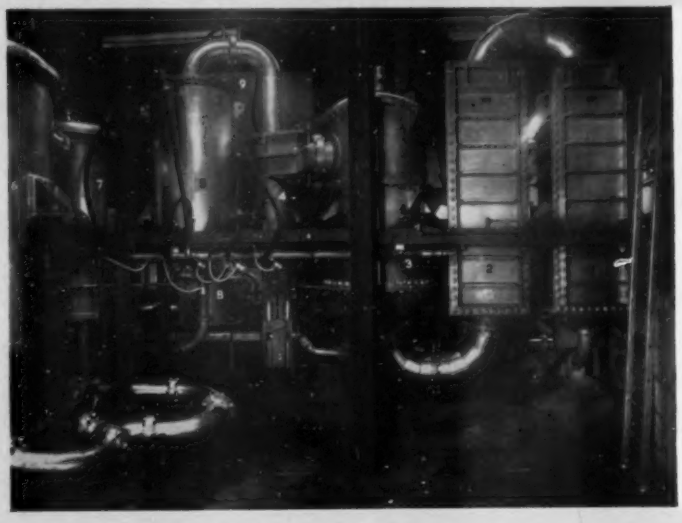

FIG. 1. — SCICE (STATIONARY CHARGE IN CONTROLLED ENVIRONMENT).

1 and 2.—Gas heaters (total power 300 kW). 3.—Charge containers. 4.—Water-cooled cyclone. 5.—Gas cooler. 6.—Water absorption vessel. 7.—Carbon dioxide absorption vessel. 8.—Gas container, included to enlarge the capacity of the system. 9.—Control cabin and instrument room.

centrate of approximately 50 per cent. of iron and 13-17 per cent. of silica. An economic appraisal of the method can be made from the data obtained.

*Blast-furnace Practice.*—Overall and stage-by-stage heat and material balances of the blast-furnace process are being carried out. The information obtained is being used for studying the theoretical aspects of injection of various materials through the tuyeres. The practicability of injecting pulverized coal and oxygen, with or without iron ore fines, into the blast-furnace hearth has been examined: the type of burner developed in the flame smelting research should be suitable for this purpose.

*New Ironmaking Techniques.*—There is a world-wide interest in the many processes other than the blast-furnace process being investigated for the making of iron. BISRA's flame-smelting process continues to make steady progress. Problems of ensuring constant rates of feed of powdered coal and ore to the high-temperature reactor have been solved and the reliability of this unit has been improved to the point where molten metal and slag can be made at will. Emphasis has now passed to improving the low-temperature stage in which the ore is to be partially reduced and preheated before it reaches the smelting reactor.

## STEELMAKING

*Oxygen in Steelmaking.*—A survey of the use of gaseous oxygen in open-hearth furnaces has shown clearly that the greater use of oxygen for accelerating combustion of the fuel and for refining the charge can increase output and reduce steelmaking costs.

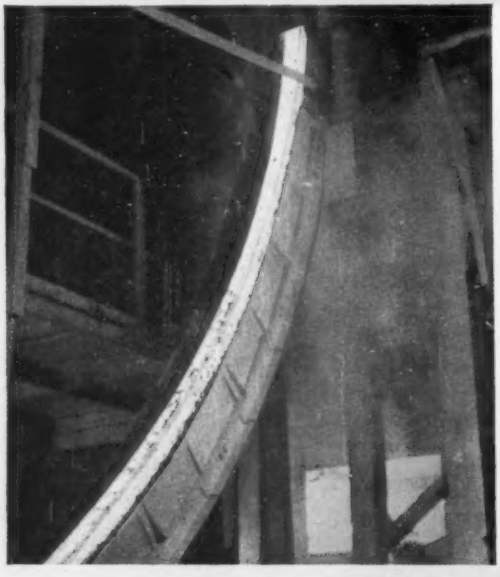

FIG. 2.—BILLET FROM THE CONTINUOUS CASTING PLANT AT CNRM BEING BENT FROM THE VERTICAL TO THE HORIZONTAL AS IT IS CAST.

*Converter Steelmaking.*—Instrument manufacturers are co-operating in extensive trials at Ebbw Vale of the Daubersy flame-brightness method for determining the end-point of the oxygen-steam converter steelmaking process.

*Electric Steelmaking.*—In this growing field of steelmaking BISRA has devised and demonstrated an automatic power input controller (APIC), a device which enables a predetermined power input programme to be applied through part or all of an electric furnace heat. Furthermore, experimental studies of heat transfer during the melting period of the electric steelmaking cycle and of the effects of voltage and power input on electricity consumption, melting time, and furnace temperature have enabled the optimum power input programme for the melting period to be specified. Proper programming of the power input combined with the use of APIC leads to substantial reductions in electricity consumption and melting time. [An account of the development of use of APIC was given in IRON AND COAL, April 29, 1960.]

*Ingot Practice.*—Numerous studies of conventional ingot casting practices are in progress on a co-operative basis. For example, the differences in yield obtained by chemical capping as opposed to fully-rimming or plating of ingots, the occurrence of subcutaneous segregates, and the methods of obtaining uniform grain size in killed steels has been investigated.

*Continuous Casting.*—A great deal of valuable operating data on the design of continuous casting equipment has been obtained from the two machines in the Sheffield laboratory. A particularly interesting development is that of a pneumatic spring-mounted mould system aimed to give good surface quality and high casting speeds.

In this system the mould is mounted on springs and is fitted with pneumatic cylinders to provide forced vertical motion. In casting, it behaves initially as a normal spring-mounted mould; that is, when friction increases the mould is pulled downward against the springs. Then, after a certain predetermined movement, the pneumatic cylinders are automatically actuated to give the mould a downward impulse. At the bottom of the stroke an upward impulse is given to assist the springs to return the mould to its topmost position where it remains until the next period of high friction.

The Centre National de Recherches Metallurgiques, Charleroi, with whom BISRA is collaborating, has had considerable success in the continuous casting of rimming steel in 8-in. square ingots using a BISRA spring-mounted mould. A hydraulic reciprocating mould used in the same machine has cast 4-in. sq. ingots of killed steel at speeds of 9 ft./min. and then bent them to the horizontal at ground level by a special guide mechanism (see Fig. 2).

## MECHANICAL WORKING

*Forging Equipment.*—The development of controls and improved handling machinery tried out in the experimental forge is being speeded up by collaboration with plant manufacturers. A design study of the remote position control for a modern 1,750-ton press has been completed. Operational studies have made it clear that slow manipulation is one of the principal causes of low utilization of forging equipment and future plant development work will aim to provide faster manipulators.

*Automatic Forging.*—Good progress has been made in this field. [See IRON AND COAL, March 11, 1960, for a report on a successful demonstration of the practicability and advantage of forging with an interlocked press and manipulator.]

*Cold Rolling.*—A method of assessing cold-rolling lubricants prior to their full-scale industrial application has been developed on the 14-in. laboratory mill. Trials on one group of new rolling oils has shown that at high speeds their lubricity is better than that of a conventional soluble oil and might, in some circumstances, approach that of palm oil.

*Tinning.*—The rust resistance of containers made with thin external coatings of tin is being investigated. It is known that the rust resistance is related to the amount of tin applied and to the roughness of the base steel. Laboratory work has shown that it is possible to smooth the steel by an electrolytic method and so reduce the surface area by between 30 and 40 per cent. in an optimum time of about 1 sec. Tinning runs at 100 ft./min. on the experimental processing line have shown that, in spite of the movement of the strip through the tank, the smoothing action still occurs. Also, it has been found that the smoothing electrolyte is quite as effective as sulphuric acid in etching. Process trials are being planned with tinplate manufacturers.

*Plastic-coated Steel.*—Two of the licensees of the Plasteel process are now in production, one manufacturing wide strip and the other narrow strip. Further licence arrangements are pending. Recently, attention has been concentrated on evolving a suitable method of applying a thin coating of PVC to strip at high speed.

*Lacquered Strip.*—Research has been directed to electrophoretic deposition of partially cured lacquers so as to avoid long curing cycles. In anticipation of a demand for faster lacquering once the problem of long curing time has been overcome curtain coating techniques have been investigated. The results indicate that curtain coatings would allow operation at line speeds in excess of 500 to 600 ft./min. for a coating 0.0001 in. thick.

*Rod and Bar Rolling.*—An optical instrument has been developed for continuously gauging bar in four planes at 45 deg. to each other and has been tested in a simple strand experimental mill preparatory to full works trials.

*Extrusion of Alloy-steel Sections.*—Trials of a new process for the manufacture of high-speed steel rounds and shapes by extrusion of cast material gives promise of metallurgical structures superior to those of conventional material, the extruded bars being comparable in surface finish to bar extruded from rolled and machined billets. Works tests are now being carried out in order to "scale up" this process for commercial use.

*Manufacture of Wire.*—Experimental work on the cooling of wire during high-speed drawing has shown that improvements in the efficiency of water cooling of up to 40 per cent. may be gained by using clean water in a closed circulation system and by preventing corrosion of the internal surfaces.

## PLANT ENGINEERING

*Forging Furnaces.*—A survey of batch reheating furnace practice has shown that relatively little practical information is available for this type of furnace operation and much more knowledge of optimum furnace conditions is desired. To obtain a quantitative measure of the influence of important variables on furnace efficiency a small batch furnace capable of heating 4-ton ingots has been constructed in the Battersea laboratories. It has been specially designed so that comprehensive programme tests can be carried out.

*Fluidized Beds.*—A pilot plant fluidized bed for rapidly and uniformly cooling 10-cwt. ingot moulds was operated in the Sheffield laboratories, and a cooling time of 46 min. was obtained compared with 380 min. for natural cooling. Investigations of the properties of fluidized beds operating at 1,250 deg. C. were continued during the year and various applications of beds to heat transfer and materials transport were studied. Provisional patents have been filed for a double fluidized bed recuperator and for a method of feeding strip through a fluidized-bed system without loss of the granular material.

*Vacuum Plant for Steel Degassing.*—A study of the requirements for the production of very low pressures, of the order of 0.01 mm. Hg, for ex-

FIG. 3.—DEMONSTRATION OF THE TALLIMARKER AUTOMATIC INFORMATION HANDLING SYSTEM AT THE BATTERSEA LABORATORIES.

periments on steel degassing, has shown that although the Roots type blower is a most useful machine for experimental plants, there may be a need for another method when larger plants are considered. For this purpose steam ejectors are considered a possible solution.

*Information Handling.*—A working display of the Tallimarker has been built as a semi-permanent demonstration model (see Fig. 3). This device consists essentially of a central information store which accumulates information about an ingot (or other material being processed) as it passes through the works, and finally prints out a complete record. Information can be fed into the store at various points in the works and as much of the stored information as is needed at any point is displayed to the process operators. The input stations on the model represent soaking pits, primary mill and shears of a hypothetical steelworks. Information is fed into the store by push buttons and displayed in summarized form by digitrons.

A motor uniselector analogue-to-digital converter has been fitted to a weighbridge to give automatic weighing of train wagons as they travel slowly and continuously across it at the furnace-shop approach. Auxiliary information identifying each wagon and its contents is simultaneously stored by means of new push-button strips for steelworks use which were developed to BISRA requirements, and both items of information relating to each wagon are finally read out automatically. The scheme has been in operation for six months with selector switches instead of push buttons, and has given very satisfactory results. A projected modification will allow net weights to be punched out on the tape direct.

## METALLURGY

*Electrical Sheet.*—The effects of impurities on the magnetic properties of high-purity 3 per cent. silicon iron are being investigated. The effects of nitrogen and carbon have already been determined and the results published. Sulphur, which may be present in quantities up to 0.02 per cent. in commercial alloys, has a marked influence on the magnetic properties: both hysteresis loss and coercive force vary linearly with sulphur content. However, it has been found that manganese, which may be present in quantities up to 0.2 per cent, modifies the influence of sulphur by altering the form and dispersion of the precipitated sulphide phase. The constant of proportionality relating losses to sulphur content drops rapidly with increase of manganese up to about 0.02 per cent. and then rises slightly with further increase of manganese. It seems, therefore, that there must be an optimum manganese content at which the sulphur present has its minimum effect.

The investigation has also shown that the presence of manganese and sulphur strongly influences the recrystallization texture. It is now possible to produce a certain amount of "magnetic texture" in high-purity alloys containing manganese and sulphur. (This is the texture normally present in high-grade grain-oriented material.) No attempt has yet been made to increase the amount of this texture in laboratory alloys, but the magnetic properties already obtained compare favourably with those of commercial material, and this work may well lead to improvements in commercial alloys.

Automatic magnetic testing equipment has recently been installed in the Sheffield laboratories. This apparatus will enable rapid measurements of the fundamental magnetic properties and so facilitate studies on electrical sheet.

*Alloy Steel.*—Internal friction techniques are being used to study grain boundary properties. The spectrum of relaxation peaks forming the damping/temperature curve contains a peak which is associated with the movement of grain boundaries and it has been shown that there are differences in the damping curves of temper-embrittled and non-embrittled steels; similarly, there are changes in the damping during the embrittlement of high purity iron-nitrogen alloys. These changes have not so far been explained.

It is necessary to investigate the damping properties systematically by assembling data on progressively more complex alloys so that ultimately commercial steels can be studied. Measurements have been made, on pure iron, of the effects of grain size and frequency of vibration on the height and temperature of the damping peak. The activation energy for the process of grain boundary damping has been calculated and shown to be similar to that for grain boundary self-diffusion. Interstitial alloying elements affect these measurements in a complex way which, for carbon and nitrogen, has now been established. As an example, the activation energy reaches a maximum as the impurity content is increased and subsequently falls to a steady value, which is considerably greater than that for pure iron. Also, the damping peak temperature for iron-nitrogen alloys progressively increases with impurity content whereas that for iron-carbon alloys reaches a maximum.

## OPERATIONAL RESEARCH

*Integrated Systems.*—A long-term project has been started on the fundamental operational and flow characteristics of an integrated steelworks. With the co-operation of a member company a study is being made of the basic structure of the information system necessary to plan the production of, and to operate, an integrated steelworks. The effect on this structure of new methods of production planning and scheduling, and of new techniques of recording and transmitting progress and control information is also being studied. Close contact is maintained with other work on computer applications and automation.

## DEVELOPMENT AND INFORMATION SERVICES

*Patents and Licences.*—Commercial development of past and current research projects continues.

The burner nozzle designed for use in the flame smelting process has attracted attention outside the iron and steel industry, and a company has been granted an option for a licence to use this nozzle in the manufacture of boron-containing compounds. Licences have been issued to two furnace builders for the manufacture of the BISRA power control system for electric-arc furnaces.

Automatic forging is now extensively covered by patents and patent applications and further licence negotiations with makers of forging manipulators and control equipment are in progress.

PVC-on-steel laminates continue to attract wide attention. Two licensees of the Plasteel process developed by BISRA are now in commercial production, one making 48-in. wide sheet and the other 18-in. wide strip. A third licensee is laying down plant and conducting preliminary trials in this country, and another, in Canada, will start installing plant during this year.

A member firm manufacturing electronic controls is producing the "Tallimarker," an automatic information-handling system for tallying the progress of ingots in a rolling mill, or of units in any other continuous process.

In the metallurgical field, the combined creep-and-fatigue testing machine and the bend-test equipment for high-speed steels are now being made under licence. Research into methods of degassing steel in a vacuum will be greatly assisted by a development arrangement with a member firm.

The association has now been granted 37 patents in the UK with 111 applications pending. Oversea, 168 patents have been granted and 126 applications are pending. A total of 41 licences, involving many of these patents and applications, have been granted, and many licence negotiations are in progress.

Income from royalties on patents was £15,923 in 1959.

# International Conference of *S.G. Iron Licensees*

EIGHTH in the series of international conferences of S.G. iron licensees, held at Innsbruck on September 15, 16, and 17, was attended by 350 delegates and ladies from all parts of Europe and also from America, Japan, Australia, and Africa. At the technical sessions, held in the City Halls, the following papers were presented and discussed:—

"S.G. Iron in Austria," report presented by R. Ziegler, director of the Austrian Foundry Institute, on behalf of the Austrian S.G. Iron Producers' Association; "Production and Application of S.G. Iron in France," report presented by R. Poirot, Ste. des Produits Metallurgiques Mond, Paris, on behalf of the French S.G. Iron Producers' Association; "Ductile Iron Developments in the Inco Sphere," report presented by J. Salbaing, International Nickel Company, New York, on behalf of the Ductile Iron Division; "Production, Application, and Economics of S.G. Iron in the Works of International Combustion, Limited," by R. Burleigh and H. Turner, International Combustion, Limited, Derby; "New Production Procedures for Preparation and Holding of Magnesium-containing Iron," report by R. H. T. Dixon on behalf of the Research Laboratory, Birmingham, of the Mond Nickel Company, Limited.

"Design and Production of S.G. Iron Crankshafts," by A. Buske, Karl Schmidt G.m.b.H., Neckarsulm, Württ; "Ductile Iron in Farm Equipment," report presented by J. L. Salbaing, International Nickel Company, New York, on behalf of the Ductile Iron Division; "Production and Use of S.G. Iron Rolls," by J. Thieme, Kölsch-Fölzer-Werke A.G. Siegen; "Bursting Tests on Large S.G. Iron Pressure Pipes for a Water Turbine," by W. Stauffer, Escher Wyss, Limited, Zurich; "A New Filler Rod for Gas-welding of S.G. Iron," and "Annealing of S.G. Iron by Continuous Cooling Through the Transformation Range," presented by R. H. T. Dixon, on behalf of the Research Laboratory, Birmingham, of the Mond Nickel Company.

On September 17, delegates studied the production of S.G. iron castings in the foundry of Tiroler Rohrenwerke u. Metallwerke A.G., where melting is effected in mains-frequency electric furnaces and magnesium treatment is carried through by use of the lance injector. The company also arranged a display of S.G. iron castings of many types made by it and which included complete equipment incorporating S.G. iron. The delegates visited all departments of the Tiroler works, including the main foundries, the spun-pipe plant, and the automatic moulding shop.

On the evening of September 15, the Association of Austrian S.G. Iron Producers entertained the delegates and ladies at a reception. On the following evening hosts at a banquet were the Mond Nickel Company.

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HOESCH WESTFALENHÜTTE has rolled 1,000,000 tons of strip on its wide strip mill since it went into operation in the summer of 1958, according to Industrieknrier, Düsseldorf. The capacity of the mill has now been raised to 80,000 tons a month, and it is planned to increase it ultimately to over 150,000 tons a month.

# *New Literature*

NEW catalogues, booklets, and other publications which have recently been received include those mentioned below. Readers wishing to obtain a copy of any of the publications referred to should apply direct to the address given, at the same time mentioning IRON AND COAL.

J. H. FENNER & COMPANY, LIMITED, Marfleet, Hull—Much of the September issue of the V-Belt Journal is devoted to the company's new wedge-belt drive, the "SpacesaVer," which was the subject of an article in the August 19 issue of IRON AND COAL.

NATIONAL UNION OF MANUFACTURERS, 6, Holborn Viaduct, London, E.C.1—September issue of the British Manufacturer (2s.) is an oversea marketing number, containing many articles of value to the industrialist anxious to extend his connections abroad.

ATLAS COPCO (GREAT BRITAIN), LIMITED, Maylands Avenue, Hemel Hempstead (Herts)—The use of compressed air in South African foundries is the subject of an article in the latest issue of Compressed Air Comments, which also contains other illustrated features.

BROOK MOTORS, LIMITED, Huddersfield—With the introduction of the "D" range of totally enclosed fan-cooled motors a further phase in the cycle of changes in electric motor design is completed. The subject is dealt with in "New Look Motors," a feature in the latest issue of the Brook Magazine.

CAMBRIDGE INSTRUMENT COMPANY, LIMITED, 13, Grosvenor Place, London, S.W.1—The company has issued a number of lists, temporary lists, and supplements to existing lists. The subjects dealt with include draught and pressure instruments, pneumatic temperature-measuring system, $CO_2$ recovery and control, and distant temperature measurement—without wires.

HAWKER SIDDELEY GROUP, LIMITED, 18, St. James's Square, London, S.W.1—The Technical Journal is a splendid example of a magazine devoted to industrial matters. The August number contains articles on "Temperature Measurement of Fuel Injection Nozzles." "Designing for Structural Safety," "High-speed Digital Data Loggers," "Control Engineering," and other subjects.

GEORGE COHEN 600 GROUP, LIMITED, 600, Wood Lane, London, W.12—Few, if any, magazines emanating from industry enjoy such a wide readership per copy as the 600 Magazine. Messrs. Puttick, Esjay, Evans, Saunders, and other cartoonists whose work figures prominently, have a large following; the standard of production generally is high, the contents are well varied, and everything about the magazine, in fact, makes it welcome in the office and in the home. The autumn number is now being read.

THOS. FIRTH & JOHN BROWN, LIMITED, Atlas Works, Sheffield 4—Firth Brown News, the house magazine of the company and of Firth-Derihon Stampings, Limited, is a first-class example of a works publication. News of employees is covered in pages of items, all amiably broken up by good photographs, news of the group is catered for in short articles by executives (again well illustrated), and the remainder of the magazine contains articles on a variety of topics contributed by members of the staff. The autumn number of this threepenny quarterly is now available.

MOND NICKEL COMPANY, LIMITED, Thames House, Millbank, London, S.W.1—The latest issue (No. 15) of the Inco-Mond Magazine contains an article on the "Thor" ramjet engine, constructed largely of 18/8 stainless steel. Other contributions include articles on the vital part played by nickel S.G. iron in the Fiat 500 motor-car, how to clean stainless steel, and the advantages of nickel-cadmium batteries. There is also an article on the paving of modern motorways, which introduces the Blaw Knox PF-90 paving machine in which nickel steels are used for many of the highly stressed parts.

MASTABAR MINING EQUIPMENT COMPANY, LIMITED, Avenue Parade, Accrington (Lancs)—"The people started up in wonder as the vast, silvery envelope passed overhead. Here was the aerial liner of the future, carrying passengers and freight to all parts of the globe. Buoyant with the lift of hydrogen, lightest of all gases, it would still remain airborne in case of engine failure. . . . These lighter than air leviathans were ships of the air indeed, majestic in every sense. But they were inflated with hydrogen—and hydrogen is an inflammable gas. . . ." The story of the "Decline of the Dirigible" is told graphically in the September issue of the Comet Journal.

ENGLISH ELECTRIC COMPANY, LIMITED, Stafford—The changeover from steam to electric winding at the Ackworth shaft of Ackton Hall Colliery, near Pontefract (Yorks), is the subject of an article by Mr. J. Ellis, of the company's mining division, in the September issue of the English Electric Journal. Mr. R. B. Larkinson, engineering section (Servo), Metal Industries division, describes the ingot buggy and shuttle car scheme at the Port Talbot works of the Steel Company of Wales, Limited, while Mr. H. S. Brown, chief engineer, Metal Industries division, and Mr. J. C. Christie, chief engineer, mining division, write on "Electrical Control Systems in Heavy Industry."

CRANE PACKING, LIMITED, Slough (Bucks)—The company, a member of the Tube Investments group, has published what it believes to be "the most comprehensive reference book to the use of gland packings that has ever been produced anywhere in the world." The book is designed for use as a work of reference and page 1 describes how the correct gland packing can be selected for any combination of service conditions. An equipment code, which is reproduced as a book mark flap, provides an at-a-glance reference to the equipment for which each gland packing is suitable. Alongside each gland packing there are code letters to complete the reference. "Gland Packings" contains many other features which should prove most helpful.

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A NATION-WIDE mobile exhibition of the latest types of jointing, including valves, gauges, cocks, and level indicators, is at present being staged by Richard Klinger, Limited, Sidcup (Kent). Trailer-mounted, and run in conjunction with Sydney Smith & Sons (Nottingham), Limited, valve and gauge specialists, the Klinger mobile exhibition will cover 4,000 miles in six months, visiting many large works.

*Internal defects on large forgings and castings form the subject of a paper contributed by J. M. Mowat, B.Sc., and P. Packham, B.Sc., both associated with William Beardmore & Company, Limited, Glasgow, to the recent symposium on "Internal Steel Quality and Methods of its Assessment" arranged by the West of Scotland Iron and Steel Institute. In a well illustrated paper the authors discuss defects that can arise during manufacture and ways of avoiding them, and make a plea for close consultation between designer and producer to avoid design features prone to defects. An abstract from the paper is given below.*

# INTERNAL DEFECTS in *Large Forgings and Castings*

## Their Nature and How They Can Be Avoided

INTERNAL defects in large forgings and castings that cause anxiety are those which exist just because large masses of steel of relatively large cross-section are being dealt with. This fact will be kept in mind while considering some examples and the possible cures.

### DEFECTS IN LARGE FORGINGS

Faulty steelmaking can produce troubles that will manifest themselves in inferior quality as measured by the normal routine methods of examination, and "dirty" steel, due to the separation of reaction products during tapping and teeming, is one result of deficiencies at this stage. The degree to which this can be tolerated depends on the product and its service requirements. As far as possible, every effort should be made, firstly to avoid the formation of these inclusions, and secondly to ensure if they do form that they rise into the ingot head where they will be removed in the discard. Indigenous non-metallic inclusions are most frequently very fine, but if they collect in a cluster they are readily detected by ultrasonic examination carried out at a later stage of production, and with experience in the use of this method of inspection their significance can be assessed and proper action taken.

During the manufacture of a fairly large important alloy-steel forging quite a number of inclusions of this type were detected by the ultrasonic equipment, and due to its known service conditions, the forging was withdrawn from production. To check the assessment of the fault, the most pronounced spot was accurately located ultrasonically and a sample extending into the defective area was removed by trepanning. This trepanned piece was broken and the fault revealed. This incident gave considerable confidence in the ability of ultrasonic equipment to locate accurately centres of trouble with some indication as to the form of the defect. It is essential that the natural solidification characteristics of all types of steel should be known and appreciated if the best approach is to be made to securing the most satisfactory product.

Although no flaw was observed in the rotor to account for the failure of the shaft, after the Shanghai disaster in 1923, when, due to the failure of a governor, a rotor forging broke up as a result of excessive overspeed, it was universally agreed that a hole should be bored along the central axis of all turbine and generator rotors to ensure that there was no internal fault, and instruments and gear were developed to make the examination of this bore possible and convincing. Boroscopes with suitable magnification have been perfected to facilitate the examination of bores of varying length and diameter. Methods of magnetic crack detection have been rendered more effective by the creation of stronger magnetic fields, and by improvements in the fluid and technique of application it is possible to locate in the bore even small or very fine flaws which can be studied through the boroscope. A number of years ago it was not unknown to find contraction cavities on the initial bore and such instances led to a general study being made by all concerned, and this resulted in a revision of mould design and forging technique. Moulds were designed with a greater taper and with a more efficient headbox. More attention is now given to the work ratio of ingot to forging, which determines the ingot cross-section and, its weight, with the result that this fault is now unusual.

#### Co-operation Between Customers and Producers

Drawings are frequently received from clients which, if followed, would not permit all the forging work on the job that would be considered desirable. In such circumstances the designer can be approached to see whether the shape he has suggested as one piece can be altered or split to accommodate a more suitable forging technique. If, however, for a good reason alteration in design is not permissible, the forgemaster can consider two lines of approach, namely, the introduction of

a complicated and expensive forging procedure, possibly involving special tools, or so arranging his methods that any natural internal ingot weakness is not located at a point of high stress. Large built-up crankshafts are typical of this type of forging, and over the years economic processes have been evolved to meet the requirements and eliminate the causes of complaint. It is comforting to know that any normal solidification weakness left in the forging does not necessarily mean that a failure from this can be expected.

In 1946 a large built-up crankshaft was put into service, and in 1959 a small crack was observed at a fillet between a journal and a web. This piece was removed from the shaft and the web broken in the plane of the crack. A number of small contraction cavities were observed following a line which later proved to be the centre line of the ingot, but this was located more than 1 in. away from the origin of the fatigue crack, and, in fact, the fatigue lines were slightly deflected as they approached one of these cavities. This indicates that such weaknesses do not necessarily concentrate any stress condition, but the stresses causing cracking in this instance were the result of external conditions and design characteristics.

Due to the accidental imposition of some thermal shock a major internal clink may form in an ingot. On forging, the ingot would probably collapse in the region of the clink and the internal discontinuity break out to the surface. This is probably an abnormal circumstance, but where a distinct and substantial discontinuity exists and the general direction is at right angles to the main flow of the metal, then that break will increase and propagate, often in quite a peculiar manner.

This was demonstrated in a case which occurred some years ago when, during the operation of boring a central hole in a 56-in. dia. forging, the boring tool behaved in an unusual manner, and on examination with a boroscope, a large hole was revealed. The forging was sectioned and the defective area split to reveal a hole. This surface was polished and a sulphur print showed a considerable relative movement across the line of fracture, even beyond the obvious hole. This startling movement of the steel during forging in the presence of a discontinuity was confirmed by a forging experiment with an " ingot " of concentric layers of coloured plasticenes to a definite scale.

### Segregate Weakness in Centre Line of Ingot

There is always, particularly in the large ingots under consideration, a tendency for weakness or looseness in the V segregate along the centre line of the ingot, and upsetting has been introduced and is widely used to close up some of these dangerous central openings. This process can be quite effective, provided the reduction in height during upsetting is sufficient. In most instances a reduction to one-half of the original length is necessary and anything short of this may only aggravate the trouble. As already mentioned, rapid taper moulds with suitable and adequate feeder heads do much to eliminate central looseness. Correct teeming conditions and uniform cooling in the mould, coupled with protection of all sensitive steels from severe thermal shock during transport, and care in re-heating, play an important part in preventing central cavities, which subsequent forging may fail to eliminate.

With large-diameter forgings produced from correspondingly large ingots the "A" segregate can be quite definite, and with certain alloy steels discontinuities are sometimes detected on ultrasonic examination. These discontinuities vary between actual cracks and small very fine, probably not quite continuous, looseness within the segregate lines. The significance and danger limit of these depends on the product, but when found they are given careful consideration and if high stresses are to be expected in the forging, especially if it is rotating at high speed, then quite small faults necessitate rejection.

### Hairline Cracks

One of the often quoted and worrying problems in the manufacture of large forgings, particularly in alloy steel, is the presence of so called hairline cracks. It is well established that when these cracks are formed early in the manufacturing cycle they can be welded up by subsequent forging, provided that there is sufficient forging work put on the job at this stage. The real danger is when the cracks appear after all forging work is completed and it is at this stage most care has to be taken. Hairline cracks are associated with hydrogen and develop under stress conditions created most frequently by temperature differences throughout the mass during heating or cooling. These " cracks " are not directly associated with segregation but are found throughout the cross-section in large measure radial, always internal, and never at the outside of the forging. They are easily detectable by the ultrasonic equipment and by magnetic crack detection on a polished plane at right angles to the axis of the ingot, which is probably the main axis of the forging away from the extreme end of the forging.

The demand for better quality steel to give the properties now required is making it necessary that still more steel be made in the basic electric-arc furnace, and this steel has usually a higher initial hydrogen content than the steel from the acid open-hearth furnace, the alternative for high-grade forgings.

Many restrictions and procedures are being adopted in steelmaking to prevent any unnecessary rise in the hydrogen content and numerous processes are being introduced to remove this undesirable factor while the steel is in the molten condition. After the forging is completed a carefully calculated prolonged heat-treatment cycle is introduced to allow for hydrogen diffusion, and definitely controlled rates of heating and cooling are employed to keep to a minimum the complicated internal stresses introduced by heat treatment all

to avoid the formation of these hairline cracks. These cracks are defects to be avoided and no high-duty forging should ever be put into service where they are known to exist. However, seldom is it ever claimed that a failure has been directly attributed to hairline cracks, while it has been observed and even recorded, that jobs which had failed or had to be withdrawn from service for other reasons have been found to contain hairline cracks which in no way contributed to the failure nor reduced the life of the forging.

Failures in large forgings that can be directly attributed to internal defects are rare. Certain disasters with large forgings in electricity generating machinery in the US were fully reported and received considerable publicity throughout the world, including this country, but in some instances at least other factors than metallurgical flaws contributed primarily to the failures. When a forging is overstressed to the danger point, failure will naturally develop from the point where the stresses applied are greater than the strength of the steel at that position. This may well be due to a stress-raiser introduced by machining, or even in the design, and not to a metallurgical defect in the steel.

## DEFECTS IN LARGE CASTINGS

Internal defects in large steel castings can be broadly divided into four types: those associated with contraction, sand inclusions, gas porosity, and shrinkage. Although internal contraction tearing unassociated with external hot tearing has been reported, in practice this type of defect is extremely rare.

In general, hot tearing is a major problem in the manufacture of large steel castings, but generally it should be classified as an external defect and is not here discussed.

### Sand Inclusions

The problem of sand inclusions can be considered partly a technical and partly a practical matter; that is, the control and composition of the moulding materials used is very important and equally important is the technique of moulding use, including such aspects as the running method and mould reinforcement. Sand inclusions are more frequently met as defects on the top surface of castings and also on surfaces to which the sand can float but from which it cannot escape. Therefore, this type of defect could be considered as predominantly external, but undoubtedly it can often be met internally. By means of radiography these internal sand pockets can be located and if considered advisable due to position or size, can be dug out and the cavity welded up.

Although it is important in every branch of foundry practice that the correct type of moulding sand be used, there is no instance where it is more essential than with heavy steel castings. Due to the pressures and temperatures involved in casting, incorrect sand can have a disastrous effect on the casting, leading to excessive rectification costs. Sand composition for heavy steel castings can be broadly divided into three types, namely, those based on "compo" or chamotte; synthetic silica sand mixes; and those based on zircon sand. Broadly speaking, European foundries have adopted the "compo" or chamotte practice, and the US the synthetic silica sand type. Zircon sand has been used with some amount of success on this class of work.

Two essential qualities required in the sand for heavy steel foundry practice are freedom from erosion by the metal stream and freedom from spalling, both of which may lead to internal defects. The sand must have a sufficiently high dry strength and/or hot strength to withstand the metal stream. Strength properties, however, cannot be quoted, because widely different figures have been reported as satisfactory; so much depends on individual foundry practices, such as mould reinforcement, running methods, etc.

Compo or chamotte materials have good volume stability and are relatively immune from spalling. This cannot be said for synthetic silica sand mixes as adopted in the US. In their practice to avoid excessive metal penetration considerable use is made of silica flour additions, and the resulting mixes have a pronounced tendency to "scab." Extensive nailing is employed to prevent this, and the mould is poured at a very quick rate for the same reason. As long as the correct practice is adhered to for each type of sand, however, satisfactory heavy steel castings can be made from both compo and synthetic sand mixes. Although sand composition is important, the essential feature is to ensure that the correct moulding method and pouring technique is adopted for each moulding material to avoid such defects as sand from the mould being trapped within the casting.

Zircon is undoubtedly the best material yet developed for the manufacture of heavy steel castings as it combines the most desirable characteristics of synthetic sand mixes and compo type materials without any major technical disadvantages. Its resistance to spalling is excellent and is on a par with compo, and its resistance to erosion is probably the best of the three main types. The maximum freedom from internal sand inclusions is to be expected from the use of this type of material.

The disadvantage with zircon sand mixes is price, but the extra cost of the sand must be balanced against its virtues.

### Gas Porosity and Shrinkage

Gas porosity is used here to denote all types of porosity of a gaseous nature including entrapped air. When present as an internal defect it is often just below the surface, and rarely, if ever, at any real depth in a heavy section. Gas porosity should not normally be met as a serious defect if proper attention is given to the steelmaking and good foundry practice. The proper addition of aluminium to the ladle can do much to reduce this trouble. Precautions that must be taken in

the foundry to counter the tendency to form these gas holes are among the fundamentals of good foundry practice. The mould and cores must be thoroughly dried, and preferably warmed up before casting, and it is essential to ensure thorough venting of all cores, preferably through vents allowing the easiest possible escape of gases. The usual running method with heavy steel castings is to run in initially at the bottom of the mould. This is likely to give the minimum of turbulence and prevent the trapping of gases. The top surface of the mould is usually fairly well vented automatically by the riser openings, but any surface at all remote from a riser must be well vented to prevent defects due to entrapped gas.

Internal shrinkage is the most troublesome defect experienced by the steelfounder making large castings. Quite often designs are produced from which it is almost impossible to make a satisfactory casting.

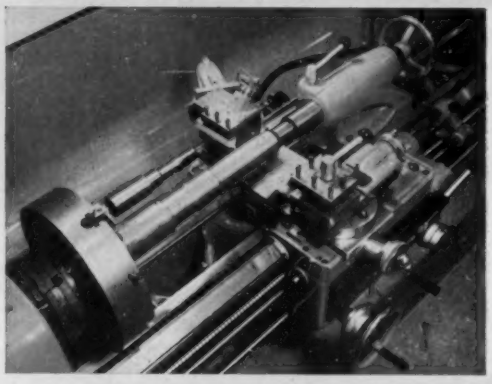
It is unfair to expect the designer to know what is reasonable because steelfounders themselves are far from unanimous on casting methods. Therefore a design produced for one foundry may not be the one most acceptable to another. The only satisfactory solution to this problem is maximum liaison between designer and foundryman. Furthermore, the designer should do his utmost to work to the suggestions of the foundryman.

Good working arrangements have in the main been established between the designers of the firms using a large quantity of heavy steel castings and the heavy foundries themselves, with definitely very beneficial results. The necessity for this liaison must be stressed, however, because with some designers its importance is not always fully appreciated.

# *Northern Machine Tool Exhibition*

OVER 80 new machine tools—every one built in Britain—were shown under power at the Northern Machine Tool Exhibition, held by B. Elliott (Machinery), Limited, at the City Hall, Manchester.

An open-sided planer known as the Invicta-Hydetsco was transported to Manchester in a special low loader. This machine and controls weigh 16 tons.



ELLIOTT CARDIFF 9¼-IN. BY 80-IN. COPYING LATHE SHOWN AT THE NORTHERN MACHINE TOOL EXHIBITION.

The exhibition attracted considerable interest, members of the general public mingling with a large number of technical engineers. Parties arrived in coaches from various parts of the north and also from the Midlands and included students from education establishments.

# UNIVERSITY COLLEGE OF SWANSEA'S DEVELOPMENT APPEAL

BRITAIN in the '60s faced the biggest challenge in its history—another Industrial Revolution, said Mr. James Griffiths, MP, who was one of the principal speakers at the formal launching ceremony last Friday of the University College of Swansea's development appeal. "The old Industrial Revolution made Britain the workshop of the world; the new will make the world a workshop," he added. Chairman of the appeals committee is Viscount Tenby, a director of Associated Portland Cement Manufacturers, Limited, and British Portland Cement Manufacturers, Limited. Other members are:—Sir Lincoln Evans, deputy chairman of the Iron and Steel Board; Mr. Griffiths; Mr. Harald Peake, chairman of the Steel Company of Wales, Limited; Mr. J. M. Pattinson, a managing director of the British Petroleum Company, Limited; Sir Julian Pode, managing director of the Steel Company of Wales, and the Bishop of Swansea.

The University College is expected to raise £500,000 as its own contribution towards a bold and imaginative development programme costing £11,000,000 in buildings alone. In a staged expansion programme the college (which is the youngest of the four Welsh University colleges) intends to more than double its present student population of 1,400 by the late '60s or early '70s. By that time all its departments will be housed in new modern buildings on the splendid parkland site overlooking Swansea Bay.

Sir Lewis Jones, chairman of the college council, who presided at the launching ceremony, announced that contributions to the fund already totalled £200,000. Included in that sum were donations by the Steel Company of Wales, Limited (£100,000), the Mond Nickel Company, Limited (£20,000), and Imperial Chemical Industries, Limited (£14,000).

Contributions should be addressed to the Appeal Secretary, University College of Swansea, Singleton Park, Swansea (Glam), from whom copies of the excellent brochure issued in connection with the appeal may be obtained.

# MANPOWER—*the Vital Factor in Mining*

## Discussion on NACM Conference Paper

*Among the authors of papers at the 1960 annual conference of the National Association of Colliery Managers was Mr. James Crawford, member for industrial relations of the National Coal Board, who expressed the firm conviction that the industry would "continue to need to maintain a very large (and increasingly skilled) labour force." The paper was published in our September 2 issue (p. 511). Considerable interest was shown in Mr. Crawford's views and the subsequent discussion is reported below.*

MR. H. H. WILSON said that after hearing Mr. Crawford, one appreciated the great difficulties which had confronted the National Coal Board over the last two years. No doubt the easy way would have been to act ruthlessly; it was to the credit of the board that it had approached its problems with a view to alleviating hardship in the mining areas.

MR. D. W. PARK said that the paper dealt with one of the most important aspects of the industry—the manpower problem. There had to be contraction, and that contraction had been accomplished in the mining industry without serious consequences to the people involved.

Drawing attention to the author's statement that both the pre-war situation and the post-nationalization situation up to 1958 had tended to make management unduly prodigal in its use of manpower, Mr. Park wondered if Mr. Crawford had generalized too much. That statement was contrary to his (Mr. Park's) experience and perhaps to that of others in management. If it had been related to the early days of nationalization he would have agreed.

### The Argument of Statistics

MR. CRAWFORD said far be it from him to suggest that management in Scotland in particular would be prodigal in its use of manpower. Perhaps he was at a disadvantage in using the argument that he had used in the paper, the argument of statistics; he was not saying that management at a particular pit or in a particular area was prodigal in the use of manpower. When labour was cheap and easy to get in any industry, management always tended not to regard discriminatingly the number of men that were taken on. He had found in all sorts of modern techniques in industry, when working on a day-wage system, for instance, that with good organization they could make do with fewer men. There was not the slightest doubt that statistically these things could be proved. Managements had been taking on more men than they would have done if they had looked around selectively and had engaged only those who could be put on full-time employment on useful work.

MR. RAYMOND WILLIAMS (North Wales) said that the board was no doubt to be congratulated on the way in which it had dealt with redundancy and had avoided large-scale reductions. It had been said that the board's work on the welfare side had been done to hold labour during a period. But there seemed to have been also a subsidizing of absenteeism. Management generally had to carry a heavy labour force to offset persistent absenteeism. Due to the changing conditions and to the necessity for training, management had to carry more non-productive labour than formerly.

MR. CRAWFORD said that Mr. Williams obviously believed that management carried more men nowadays than formerly because of absenteeism. That argument, however, was ruled out. Absenteeism was higher today than it was two years ago; so that the argument really meant that, because of the higher absenteeism, management should be carrying today a greater number of men in relation to production than before. If absenteeism today were the same as it was in the former years, that again would cancel out the argument.

MR. W. DUNCAN (Scottish Branch) said that in the last six months morale in the industry had sunk very low. It looked as though they would have a great deal of trouble in finding the people they wanted. With regard to the social and technical changes which were taking place, he invited Mr. Crawford's view as to which was moving forward faster. He himself believed that technical change was moving very much faster than social change, and in support of that opinion he mentioned the extending use of nuclear power and automation.

MR. CRAWFORD commented that, as a board member, he was not sure how far he could enter into discussion on some of the points raised by Mr. Duncan. He would not go into the political field. There were very great advances in the world, both social and technical, and very obviously technical progress would continue. When he was spokesman to the trade union movement on electronics and automation, one of his jobs was to convince people that automation was ultimately for the good of mankind, but that change did not necessarily synchronize with the social changes that were necessary to get the best out of it.

At the beginning of the century the development of the internal-combustion engine displaced horses, blacksmiths, the cabman with his whip, and so on—

probably a hundred different avocations of the working man—but it had also created new employment in steel, rubber, and mechanical engineering; it had probably created a dozen jobs for every job it had displaced. The machines had to be made and there had to be many manufacturers and mechanics to service the machines.

It would require perhaps the next 10 or 20 years of serious constructive thinking and recognition of the facts to spread the social benefits of automation. It was of no use trying to keep the benefits of technical improvements to a selected few; they had to be spread throughout the mass of the people; otherwise there was not much value in technical change.

MR. L. R. MILLIGAN, proposing a vote of thanks to Mr. Crawford for his address, said that it was constructive and interesting. His criticisms on management were not at all severe. Reference had been made to the useful employment of labour. Mr. Milligan did not propose to enter into argument on that point, but he felt bound to admit that in his experience as a manager he was not particular on some occasions about the numbers of men he employed.

Mr. Crawford and his department, in difficult times, had done a great job in keeping the degree of unemployment to the minimum, relieving social hardship, and trying to walk hand-in-hand with the Government on questions relating to employment. Mr. Milligan urged that there should be more action in walking hand-in-hand with the Government's employment policy in Scotland, because the unemployment rate there was very much higher than elsewhere in the country. That created a particular problem.

# "Getting the Best Out of Coal"

CHIEF scientist of the Ministry of Power, Dr. C. M. Cawley, will introduce the theme of the Combustion Engineering Association's conference to be held at Harrogate (Yorks) on November 8 and 9. The theme, as previously announced in IRON AND COAL, will be "Getting the Best Out of Coal."

Dr. Cawley's introduction will be followed by a talk by Mr. A. H. Slade (chief fuel technologist, Marketing Department, National Coal Board) on the selection of coal and what the new NCB sales service has to offer to the consumer. Mr. R. C. Tomlinson (deputy head of the NCB's field investigation group) will explain the procedures for sampling and their application in ensuring a consistent grade of fuel for each particular purpose. These addresses will be followed by open discussion to be introduced by Dr. G. Armstrong (Imperial Chemical Industries, Limited).

The field of fuel-using appliances, being so wide, has been divided into two parallel studies embracing (*a*) boiler plant with the conference chairman (Mr. N. A. McNeill, president of the CEA) in the chair and (*b*) industrial furnaces and kilns under the chairmanship of Dr. D. T. A. Townend (director-general, British Coal Utilization Research Association). In a session devoted to operating and maintaining the plant one division will hear a talk on boiler plant by Mr. F. L. Griffiths (consultant for fuel and boiler plant, General Electric Company, Limited), while the other division will be addressed by Mr. E. Rowden, superintendent, kiln department, British Ceramic Research Association, on kilns in the heavy clay and refractory industries, and Mr. R. Brown (National Industrial Fuel Efficiency Service) will talk on industrial furnaces.

The third session will be devoted to choosing new plant or extensions to existing plant and will again be split into two divisions, the boiler division being addressed by Mr. J. E. H. Moore (head of the commissioning and operating department, Ewbank & Parners) and Mr. J. J. Whiteheart (fuel technologist, Pilkington Bros., Limited), will addresss the division concerned with industrial furnaces and kilns.

All delegates will combine for the final session to hear an address on new developments in boiler plant by Mr. G. G. Thurlow (BCURA) and an address on new developments in industrial furnaces and kilns by Dr. P. L. Start (Department of Fuel Technology and Chemical Engineering, Sheffield University). Open discussion will be inaugurated by Dr. A. A. Taylor (NCB).

At a formal dinner on the second night the principal speaker will be Mr. Alfred Robens, who will have then taken up his appointment as a deputy chairman of the National Coal Board.

Full details, including application forms, of the conference may be obtained from the Secretary, Combustion Engineering Association, 70, Jermyn Street, London, S.W.1.

## IRON-ORE PRODUCTION EXPANSION IN SWEDEN

MINING in the Kiruna and Malmberget regions was at present at a rate of some 15,000,000 tons of iron ore a year, a spokesman for the Swedish iron-ore company, Luossavaara-Kiirunavaara AB (LKAB), said recently. By 1965 LKAB expected production to be at a rate of 15,000,000 tons a year at Kiruna and 6,000,000 tons at Malmberget.

An obstacle in the present production development was a shortage of adequate shipping ports, but expansion of the Luleå port, at present planned, would cover requirements for shipments over that route. The problem of increased shipments through Norway, however, was complicated, the spokesman said, as Tombbaksbotn was the only port suitable for development.

# *Economic Use of Refractories*

## IMPORTANCE OF CORRECT SELECTION

INITIAL life and service cost that can be expected from refractories are important factors in decisions affecting their use. In making a choice it is worth remembering that transport and bricklaying costs are about the same for the different kinds of bricks. In many cases, states K. W. Hansen, in a recent article,* this is very significant because the practice of false economy can be avoided by using a better refractory of a given class, at a slightly higher base price than that of another not typical of the best.

In some applications, bricks of lower cost serve particular purposes for which they are especially suited, more advantageously than others of higher cost. On the other hand, some refractories costing much more are used in large quantities because of necessity and consequently, actual economy. At one time conventional high-duty fireclay bricks produced at a relatively low cost were adequate for some applications, for which far superior refractories are now needed. Reference may be made to the use of basic brick in place of silica in the roofs and other parts of open-hearth steel furnaces. Other examples are the use of basic forsterite refractory, namely, magnesium silicate, basic brick of spinel and other compositions, costing several times that of fireclay bricks, for open-hearth furnace regenerator checkers.

On the other hand, exceedingly strong wear-resisting bricks are available at the usual price for high-duty fireclay bricks, which far surpass any other refractory in service life in many applications. The use of the best refractory for a given purpose, contributes much to greater production by the avoidance of frequent shutdowns for maintenance. With the greatly improved refractories now available as compared with those produced some years ago, higher rates of production and improved products are practicable. Higher temperatures and generally more severe operating conditions, go hand in hand with higher rates of production and accordingly refractories of greatly enhanced properties are needed.

### Special Refractories

Special refractories for particular needs in a large measure contribute to the progress in many important industrial developments. The Pittsburgh research centre of Harbison-Walker Refractories Company functions primarily to this end. Several of the noteworthy achievements are metal-encased basic bricks of enhanced physical properties with internal plates, used with very satisfactory results in oxygen steel-making open-hearth furnace roofs; forsterite regenerator checkers, and special type of basic brick and monolithic material for the expanding use of oxygen steelmaking processes. Furnace design with various accessories and furnace operation are important in connection with the best economy in the use of refractories.

Insulation has become widely used for the conservation of fuel and as well for other operating factors. Thus, a furnace built of insulating bricks has the advantage that it can be brought up to operating temperatures more rapidly than is the case without insulation. There are now available in the U.S. approximately 10 classes of insulating refractories all of which are especially adapted for specific requirements. The best selection of sizes and shapes of bricks is extremely important. Standard sizes and shapes not only cost less, but in many applications fulfil the requirements to better advantage than do special intricate shapes. The selection of the proper refractory for a given set of conditions obviously is necessary for lowest costs in their use. This applies for bricks as well as for the mortars of which many kinds are available.

Monolithic refractories comprising castables, plastic firebrick and various ramming mixes have become important assets in refractories practices. In some cases these are used with advantage for complete linings and in others with economy for making emergency repairs, ordinary patching and in making special shapes needed in a hurry.

The maximum service life from refractories used is not always paramount. Other factors sometimes are of greater importance. For example, aluminum melts at a relatively low temperature. Yet refractories of very high alumina content which are suitable for temperatures even 1,100 deg. C. higher than that of the melting point of the metal are preferred to others. Two entirely new kinds of high-alumina brick are now used with excellent results in the avoidance of objectionable contaminants to alloys required to meet exceedingly close composition specifications.

Thermal conductivities, densities and other properties of great importance aside from the durability in service are especially important in the most economical practice for some applications.

Proper care in handling bricks and good bricklaying are extremely important factors in securing the most from the refractories. The avoidance of their unnecessary abuse in service, by careful supervision of operation, can greatly influence the cost of refractories. Numerous variables are involved in the operation of many processes. By keeping these within the narrowest limits for best results from the refractories, much is accomplished in keeping costs to a minimum. The selection of the proper refractory for each application, most dependably based on experience is a fundamental requisite.

* Blast Furnace and Steel Plant, June, 1960.

# Mining Oversea

*in which we review, from time to time, interesting mining matters reported by our contemporaries abroad*

## BOREHOLES TO RELIEVE GAS OUTBURSTS

RELIEF boreholes of 4½ in. dia. have been drilled at the Belgian colliery Ressaix in advance of certain lateral roads and in development workings in coal which are prone to violent sudden outbursts of gas. It takes three men 3 hr. to mount the Nüsse & Grafer drill rig in position and it takes them four to five shifts to drill a set of 12 holes. Percussion shots are still standard practice, but gas outbursts have been very rare since the relief-hole method has been perfected.—Bulletin Technique-Mines, Institut National de l'Industrie Charbonnière, Belgium, No. 73, July, 1960.

## FASTER DRIFTING

DURING a competition by one of the leading Ruhr mining yearbooks for new ideas, the suggestion was made to speed up drifting by blasting the round on to a heavy platform which is supported on steel rollers running between steel channels, laid along the floor up to the face.

A winch pulls the platform, with 80 tons of debris, away from the face, a distance of about 30 ft., where a loading machine can deal with the debris while the face is ready to be drilled at once when the support has been extended. An aerial ropeway serves for the transport of the drills, arches, and ventilation tubing to the face.—F. KEIENBURG, Schlägel und Eisen, June, 1960.

## LARGE COAL FROM SHEARER LOADERS

AFTER the Fürst Leopold-Baldur Colliery in the Ruhr had introduced shearer loaders, the percentage of the unsaleable coal under ⅛ in. rose by 45 per cent. This has now been reduced to 30 per cent. by fitting the shearer drum with only 26 cutter picks instead of 62, by a better distribution of the picks, and by designing the plough in the form of a portal frame with a trap door, so that it loads an increased proportion of coal on the flitting run.—G. WILDE, Glückauf, July 2, 1960.

## NEW RADIAL-FLOW MINE FANS

THE Central Aerodynamic Institute in Moscow has designed two types of radial-flow mine fans with backward inclination of the blades and with inlet guide vanes. Fig. 1 shows the dimensions of the model of one of the types which has six impeller blades, 10 guide vanes, and a diffusor. The upper graph shows how the efficiency rises at varying blade angles to a maximum of 83 per cent., and the lower graphs indicate the specific head H and the specific power consumption N as functions of the specific air flow Q.

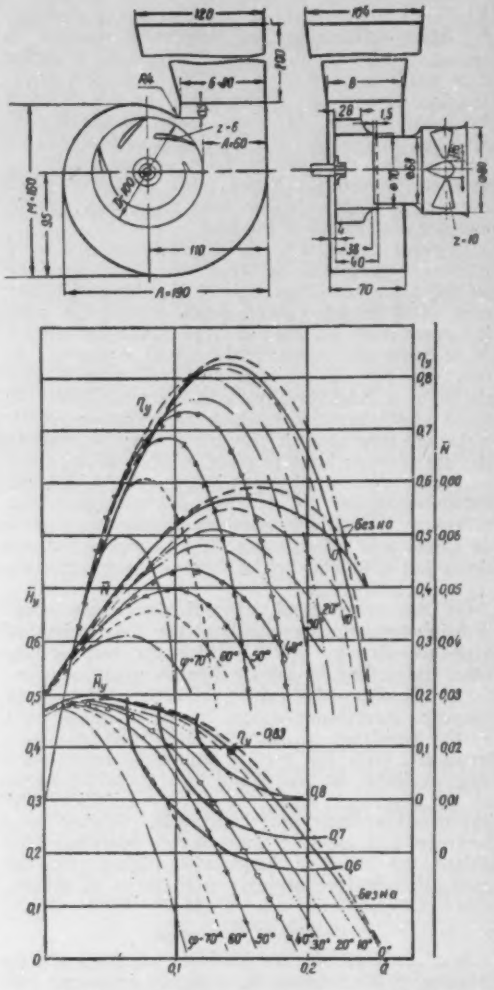


FIG. 1.—DIMENSIONS OF THE MODEL OF NEW RADIAL-FLOW MINE FAN.

120, 5 in.; 200, 8 in.; 6-80, 3⅛ in.; z-6, six blades; A-60, 2⅜ in.; R4, ⅛ in. radius; D100, 4 in. dia.; 110, 4⅜ in.; V-190, 7½ in.; M-160, 6⅛ in.; 95, 3¾ in.; 104, 4⅛ in.; B, 3½ in.; 28, 1⅛ in.; 1,5, 0.006 in.; 4, ⅛ in.; 38, 1½ in.; 40, 1.⅝ in.; 70, 2¾ in.; ϕ70, 2¾ in. dia.; ϕ68, 2.⅝in. dia.; ϕ16, ⅝ in. dia.; ϕ80, 3⅛ in. dia.; z-10, 10 guide vanes.

It is proposed to equip the actual fans with impellers from 3 ft. 3 in. to 14 ft. 5 in. dia. and to drive them by electric motors at speeds ranging

from 1,500 to 300 r.p.m.—A. G. BYTCHKOV and I. L. LOKSHIN, Ugol, March, 1960.

### METHANE DRAINAGE IN FRANCE

COLLIERIES near Lievin in northern France are very gassy and were some of the first to install methane drainage equipment in order to keep the methane content within permissible limits. Drainage holes are usually drilled at 30 to 45 deg. and from 165 to 200 ft. deep and 50 to 100 ft. apart. Diamond bits of 4 in. dia. are used in hard ground and tungsten-carbide bits of 2½ in. dia. with reamer bits to 3½ and 4½ in. dia. for two-pass enlargement in soft ground.

Observations have proved that the methane content in the return air drops within an hour after connecting up a drainage hole to the exhaust system. Some holes last only for a few days and some over a year, but the average active life is three to four months. Boreholes are generally abandoned when the methane content drops below 30 per cent.

In view of the capital investment required it has been agreed that drainage equipment should be installed only when a coal seam gives off more than 885 cu. ft. of methane per ton of coal.—R. LELEUX, Annales des Mines, May, 1960.

### NEW GERMAN IRON-ORE DISCOVERY

NEW iron-ore deposits with reserves of at least 100,000,000 tons, with 38 per cent Fe, 7 per cent. $SiO_2$, and 0.7 per cent. P, have been located 30 miles south of Bremen. Two boreholes intersected the deposit at depths of 990 to 1,550 yd. after geophysical investigations had indicated its existence. The Barbara Iron Ore Company, of Düsseldorf, has decided to sink a pilot shaft to a depth of 1,200 yd. It is expected that the first batches of ore will become available for metallurgical treatment in about four years' time.—Schlägel und Eisen, June, 1960.

## "Britain's Coal"

"BRITAIN'S COAL" is the title of a 60-page report of a study conference organized last March by the National Union of Mineworkers. Sir Geoffrey Crowther presided over the conference, which extended over two days, and papers were presented by Mr. E. F. Schumacher, the National Coal Board's economic adviser ("Coal—the Next 50 years"), Mr. S. Kessler, NUM research officer ("Coal—the Present Situation"), and Dr. D. T. A. Townend, director-general of the British Coal Utilization Research Association ("Coal and Science").

The report contains the full text of the three papers and an account of the discussions.

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A GERMAN GROUP, in association with Brazilian interests, is installing a factory in Guarulhos, near São Paulo, for the production of tools for the engineering, motor vehicles, and agricultural machinery industries. The Bank of London & South America states that the factory will be the first of its kind to be set up in Brazil.

## NEW ROCK DRILL WITH INTEGRAL AIRLEG

BY making the airleg an integral part of its new Silver Thirty-Three rock drill, Holman Bros., Limited, Camborne (Cornwall), has been able to group all controls within easy reach of the operator's hand.

All the operating air enters the machine through a single hose and is distributed internally by controls situated in the backhead. The airleg control is of the roller ratchet type and the main throttle also controls the flow of water to the drill bit. This grouping of controls gives easier and quicker operation, while the built-in water control automatically ensures a flow of water immediately drilling starts.

A WEST AFRICAN STUDENT OF THE CAMBORNE SCHOOL OF MINES DRILLING WITH THE NEW SILVER THIRTY-THREE AT THE TEST MINE OF HOLMAN BROS., LIMITED.

Following rigorous trials at the Holman test mine in Cornwall, a number of the new rock drills are already at work in Canada and are proving highly popular.

The new Silver Thirty-Three with its ease of operation, particularly when collaring, will find many applications in all types of mining, quarrying and civil engineering. The drill has a 3-in. bore and a $1\frac{1}{16}$-in. stroke with a shank length of 4½ in., and the airleg has a feed length of 58 in. The total weight is 105 lb.

# *Forthcoming Events*

OCTOBER 8

*North of England Institute of Mining and Mechanical Engineers:*—Meeting in the Lecture Theatre, Neville Hall, Newcastle-upon-Tyne 1, at 2.30 p.m.: "The Application of Hydraulic Power to Plough Installations in Northumberland," by R. R. G. P. Jackson, T. Harris, and T. N. Sneddon.

*Institute of British Foundrymen (Scottish Branch):*—Meeting at the Royal College of Science and Technology, Glasgow, C.1, at 3 p.m. Presidential address by James H. Andrew and "Recent Developments in Foundry Practice," by James W. Hamilton.

OCTOBER 10

*Institution of Chemical Engineers:*—Meeting at the Royal Institution, Albemarle Street, London, W.1, at 3 p.m. Symposium on "Surface Effects and Liquid Behaviour."

*Institution of Production Engineers (Manchester Branch):*—Meeting at Reynolds Hall, Manchester College of Science and Technology, Manchester, at 7.15 p.m. "Rail Traction Diesel Engines—Design for Production," by T. E. Draper.

*Institution of Plant Engineers:*—Meeting at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 7 p.m. "Utilization of Flash Steam," by C. R. Crosse.

*Junior Institution of Engineers (Sheffield and District Section):*—Annual general meeting at Livesey Clegg House, 44, Union Street, Sheffield 1, at 7.30 p.m.

*Institute of Marine Engineers (West of England Section):*—Meeting in the Small Engineering Lecture Theatre, University of Bristol, University Walk, Bristol 8, at 7.30 p.m. "Corrosion and Fires in Marine Boiler Air Preheaters," by A. Bell.

*Institution of Electrical Engineers (South Midland Supply and Utilization Group):*—Meeting at the College of Technology, Gosta Green, Birmingham. "A Basis for Short-circuit Ratings for Paper-insulated Cables up to 11 kV," by L. Gosland and R. G. Parr, and "Short-circuit Ratings for Mains Cables." by G. S. Buckingham.

OCTOBER 11

*Institution of Electrical Engineers (Measurement and Control Section):*—Meeting at Savoy Place, London, W.C.2, at 5.30 p.m. "Time and Insulation." by C. G. Garton.

*South Staffordshire and Warwickshire Institute of Mining Engineers:*—Annual general meeting at the Swan Hotel, Lichfield, at 3 p.m.

*Institution of Structural Engineers (Scottish Branch):*—Annual dinner and dance at the Grosvenor Restaurant, Gordon Street, Glasgow, at 7.15 p.m.

*Institution of Production Engineers (Birmingham Graduate Section):*—Meeting at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 7 p.m. "Quality Control," by L. A. Hoefkens.

*Institution of Plant Engineers (Birmingham Branch):*—Meeting at the Hotel Leofric, Coventry, at 7.30 p.m. "Modern Air Compressors and Equipment."

*Institution of Plant Engineers (Manchester Branch):*—Meeting at the Engineers' Club, Albert Square, Manchester, at 7.15 p.m. Three films by the Mobil Oil Company, Limited.

OCTOBER 12

*North Wales Metallurgical Society:*—Meeting in the lecture theatre, Flintshire Technical College, Connah's Quay, near Chester, at 7 p.m. "The Production of Steel Tubes and Pipes by the Electric Resistance Welding Process," by G. H. Armitage.

*Combustion Engineering Association:*—Meeting at the Grand Hotel, Charing Cross, Glasgow, at 10 a.m. Discussions on "Factors Affecting the Choice of New Boiler Plant" and "The Ability of Mechanical Stokers to Comply with the Clean Air Act."

*Institution of Chemical Engineers (Midlands Branch):*—Meeting at the Midland Hotel, Birmingham, at 6.30 p.m. "Fundamental Considerations in Biological Treatment of Effluents." by A. L. Downing and A. R. Wheatland.

*Institution of Production Engineers (Peterborough Branch):*—Meeting in the conference room, Peterscourt, Peterborough, at 7.30 p.m. "Forum."

*Institution of Production Engineers (Preston Branch):*—Meeting at the Accrington College of Further Education, Sandy Lane, Accrington, at 7.30 p.m. "Investment Castings." by M. Riddihough.

*Institution of Electrical Engineers:*—Meeting at the Southern Electricity Board, 37, George Street, Oxford, at 7 p.m. "Some Engineering Problems on Nimrod." by P. Bowles.

*British Coal Utilization Research Association:*—Meeting at the Institution of Civil Engineers, Great George Street, London, S.W.1, at 5.30 p.m. Ninth Coal Science Lecture: "The Hydrogenation of Coal to Methane," by Dr. F. J. Dent.

*Institution of Marine Engineers (Scottish Section):*—Meeting at the Institute of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 6 p.m. "Rationalization in the Marine Engineering Industry," by T. W. D. Abell.

*Institution of Plant Engineers (East Midlands Branch):*—Meeting at the County Hotel, Theatre Square, Nottingham, at 7 p.m. "The Yorkshire Motorway," by J. Michie.

*Institution of Plant Engineers (Western Branch):*—Meeting at the Main Lecture Theatre, University of Bristol, at 7.15 p.m. "Steam for Process," by L. G. Northcroft.

OCTOBER 13

*Institute of Engineers and Shipbuilders in Scotland:*—James Watt dinner at the St. Andrew's Halls, Glasgow, at 6 p.m.

*Institute of Marine Engineers (North East Coast Section):*—Meeting at Stephenson Building, King's College, Claremont Road, Newcastle-upon-Tyne, at 6.15 p.m. "Design and Construction of Nuclear Marine Propulsion Plant of Water-cooled Type," by W. R. Wootten.

*Institution of Production Engineers (Gloucester Section):*—Meeting at the Technical College, Brunswick Road, Gloucester, at 7.30 p.m. "Introduction to Milwaukee-Matic," by A. Tack.

*Institution of Plant Engineers (Glasgow Branch):*—Meeting at the Scottish Building Centre, 425, Sauchiehall Street, Glasgow, at 7.15 p.m. "Fire Wastage and the Plant Engineer," by G. W. Browning.

*Institution of Plant Engineers (North East Branch):*—Meeting at Roadway House, Oxford Street, Newcastle-upon-Tyne 1, at 7 p.m. "Materials Handling," by E. R. C. Farmer.

*Institution of Plant Engineers (Sheffield and District Branch):*—Meeting at the Blue Bell Hotel, Scunthorpe, at 7.30 p.m. "Design and Maintenance of Heavy Duty Gears," by G. D. Parkinson.

*Institution of Electrical Engineers (Utilization Section):*—Meeting at Savoy Place, London, W.C.2, at 5.30 p.m. "Developments in Electrical Plant for Industry," by J. M. Ferguson.

OCTOBER 14

*Southern Counties Institute of Mining Engineers:*—Annual general meeting at 3, Grosvenor Crescent, London, S.W.1, at 3.30 p.m. Presidential address.

*Institute of Marine Engineers (South Wales Section):*—Meeting at the South Wales Institute of Engineers, Park Place, Cardiff, at 7 p.m. "Recent Developments in Pump Auxiliaries for Ships," by T. McAlpine and I. S. Paterson.

*Institution of Plant Engineers (Blackburn Branch):*—Dinner and dance at the White Bull Hotel, Blackburn.

OCTOBER 17

*North East Coast Institution of Engineers and Shipbuilders:*—Meeting at Bolbec Hall, Newcastle-upon-Tyne 1. Presidential address by J. B. Woodeson.

*Institution of Production Engineers (Sheffield Graduate Section):*—Meeting at Robert Jenkins & Company, Limited, Wortley Road, Rotherham, at 6.30 p.m. "Production Welding Techniques," by a representative of the company.

*Institution of Production Engineers (Newcastle-upon-Tyne Section):*—Meeting at the Rutherford College of Technology, Northumberland Road, Newcastle-upon-Tyne, at 7 p.m. "The Institution and the Commonwealth," by W. F. S. Woodford.

*Institution of Electrical Engineers (Mersey and North Wales Centre):*—Meeting at the Town Hall, Chester, at 6.30 p.m. "Short-circuit Ratings for Mains Cables," by G. S. Buckingham, and "A Basis for Short-circuit Ratings for Paper-insulated Cables up to 11 kV," by L. Gosland and R. G. Parr.

*Institution of Electrical Engineers:*—Meeting at the George Hotel, King Street, Reading, at 7.15 p.m. "The Development of Miniature Circuit Breakers for Circuit and Earth Leakage Protection," by J. A. Robbins.

OCTOBER 21

*Mining Institute of Scotland:*—Annual dinner (followed by dance) at the Central Hotel, Gordon Street, Glasgow, at 6.30 for 7 p.m.

## National Association of Colliery Managers

OCTOBER 11

*Yorkshire Branch:*—Visit to Brodsworth Colliery surface, followed by presidential address by R. A. Macdonald.

OCTOBER 21

*South Midland Branch:*—Annual dinner and dance, Kings Head Hotel, Loughborough.

# DEVELOPMENT OF SINTER PLANT AUTOMATION

## *Outline of General Principles*

*Increasing use of sintered iron ore in the blast-furnace burden is creating a rapidly growing demand for this raw material. To meet it, production must be increased, not only by improvements in sinter plant design but also in operating technique. In this connection the benefits to be derived from automation are of great importance and are being given the close attention of the steel industry in this country and elsewhere. An interesting paper* on the subject by D. E. Hamilton and R. L. Houlton, both associated with the General Electric Company in the United States, was presented at a recent meeting of the American Institute of Electrical Engineers. Extracts from this contribution are appended.*

COMPLETE automation of a process can only be accomplished when all of the relationships between the independent and dependent process variables are known, thus permitting a mathematical expression to be written defining the dynamic process. Many independent and dependent variables are present in the sintering process, which is a complex combination of thermal, chemical, and physical relationships, guided by human intelligence.

Sinter plant technology has been limited by lack of knowledge of these dynamic relationships. Therefore application of automation techniques has been a step-by-step progression toward the ultimate goal.

### Local Process Regulators

The first step in sinter plant automation is the application of individual regulated drives whose set points are adjusted manually as a result of human observation and knowledge of the process. The second step is to supply local process regulators which automatically and continually adjust the individual drive regulator set points as a function of variations occurring elsewhere in the process. These local process regulators are applied as knowledge of the process increases. Again, human observation and knowledge of the process leads to manual adjustment of the process set points. The final step in automation of sinter plants will be achieved when local process regulators are automatically adjusted from a process director having the ability to store and solve the dynamic equations describing the process. This is a job for a modern industrial digital computer.

At the present time individual regulated, adjustable speed drives have been applied to the following:—(*a*) Raw materials bin table feeders having 10- to 16-in. individual drives; (*b*) sinter machine bed feeders (swinging spout, roll feeders, etc.) two or three drives; (*c*) sinter machine pallet conveyor, one drive; (*d*) sinter cooler, three or four drives with one regulator; (*e*) pug mill water flow with one drive.

Local process regulators have been applied to perform the following functions:—

(1) Raw materials proportioning system, in which individual bin table feeder regulated drives are continuously adjusted as required to maintain a constant pre-set proportion of each raw material in the sinter mix over the total sinter mix flow range regardless of disturbances introduced in the system.

(2) Automatic "burn-through-point" system, in which the sinter-mix feed-rate to the sinter machine and in turn the sinter machine pallet conveyor speed are regulated to maintain the point along the length of the machine where the sinter bed is completely burned through.

(3) Automatic sinter machine bed-level control, determined by a cutter bar which dams up excess material. In order to minimize packing down of the sinter bed which affects its permeability, it is desirable to limit the amount of material retained behind the cutter bar. In the automatic bed-level regulator, a probe system is used to sense the amount of mix behind the cutter bar and provide a vernier reference signal to the sinter machine drive speed control.

(4) Automatic sinter machine slowdown due to low ignition temperature. When the ignition gas pressure is low, the time the sinter bed is under the ignition hood must be lengthened in order to obtain proper ignition of the sinter mix. A radiation pyrometer is used to sense the temperature of the ignited sinter mix as it emerges from the ignition hood. If the bed temperature is less than a pre-set amount the desired burn-through-point signal is reduced until the desired bed temperature is again reached.

In all of the above local process regulators, only

* Blast Furnace and Steel Plant, June, 1960.

physical quantities are controlled; for instance, proportions of raw materials by weight. Nothing is done toward regulating the chemical composition of the sinter mix other than perhaps readjustment of the raw material proportions some 8 to 24 hr. after a sample has been taken for wet chemical analysis. The development of an industrial on-line continuous X-ray emission gauge, now permits regulation of the raw materials proportions to achieve a chemically uniform sinter mix.

Briefly, X-ray emission spectroscopy is based upon two basic principles:—(1) When X-rays of sufficient energy fall upon a material, it will fluoresce or emit X-rays; (2) the energies of these emitted X-rays are characteristic of the elemental composition of the material, while the intensity of the emitted X-rays is dependent upon the amount of the element present in the material sample.

The XEG emission gauge contains channels with a fixed geometric relationship of the X-ray detection components for each element to be measured in the sample. The intensity of each wave length of emitted X-ray characteristic for each element is measured by a counter tube similar to a Geiger tube on a scintillation counter. Through rate-meter circuitry the pulse output of each detector tube is converted to a voltage proportional to the percentage of the element present in the sample.

### Feedback Signal

In its simplest application, the XEG may be used to provide a feedback signal to the proportioning system to allow proportioning according to weight of those elements in the ore and additive materials which are important to the sintering process. In such an arrangement, the total amount of ore in the sinter mix serves as the reference to the fuel and flux materials to be proportioned. Though the amount of fuel is proportioned to the amount of ore, it is also compensated for the fuel in the ore. Likewise, the flux required is proportioned to the amount of acidic materials in the ore and fuel, compensated for the basic material in the fuel and the acidic elements in the flux material.

The use of on-line analysis gauges allows greater predictability of the sinter product and provides measurement of another independent variable that may be used for controlling the process. However, the sinter plant operator is faced with the problem of monitoring this data and initiating changes in reference signals for the process regulators in order to maintain a chemically uniform sinter mix. It is in this area that the application of an industrial computer is appropriate. Initially the computer would be used as a data logger and a "charge computer" computing the correct proportions of raw materials required to maintain a chemically uniform sinter mix. In its initial operation the charge computations would be made according to the same formula now used by the plant metallurgists.

As additional process equations are developed from analysis of logged data, they would be programmed into the computer, thus further freeing the plant operator from the need for mental calculation of the many pieces of data required for an optimum setting of regulator reference signals. As the hypothetical equations are proved in service, the next logical step is to replace the human intelligence block between the process computer and the process regulators by having the computer automatically direct the change of the process regulator set-points.

At the present time, four XEG on-line analysis gauges and a G.E. 312 industrial digital computer are being installed in a sintering plant. The computer will be used initially as a data logger for the accumulation of the process data. The computer, in addition to logging data from the XEG gauges will log data from some 50 other sensors such as draughts, temperatures, flows, etc., and will utilize its computing ability to linearize, calibrate, digitally average, and totalize sensor signals, compute significant process quantities based on the sensor signals, prepare management summary reports, provide process surveillance through an off-normal alarming function, print all data on a typed log sheet for use of the plant operator, and punch all data on punched paper tape for analysis and study by the engineering and research departments using common paper processing computers.

The application of automation to sinter plants, or to any process for that matter, requires a continual upgrading of the conventional electrical equipments such as the means of providing adjustable voltage for the d.c. drive motors, regulating control equipment for the drive and process controllers, as well as industrial type sensing and computing equipment suitable for the adverse ambient conditions found in sinter plants.

### Future Development

Regarding future development of sinter plant automation, the authors point out three requirements. The plant operators must document the science of the process including a knowledge of cause and effect relationships and of the measurements of product value. The machinery builders must continue to pay careful attention to plant design to make transport times as short and as equal as possible, to eliminate sources of mechanical disturbances, and to ease the problem of obtaining measurements of the process.

The instrumentation industry must develop or improve industrial quality sensors that will continuously measure physical and chemical properties of the materials in the process.

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### Colombian Coal

The Instituto de Fomento Industrial has submitted a report on the El Cerrejón coal deposits to the Colombian Minister of Development. The deposits are situated in Guajira, about 62 miles from the port of Ríohacha; proved reserves total 36,000,000 tons and probable reserves 212,000,000 tons. Production is expected to begin in 1962 with an initial output of 1,000,000 tons per annum. Investigations confirm that the coal from El Cerrejón can be used in mixtures with other coal to obtain good quality coke for metallurgical purposes.

## *Company News*

# Delta Metal Expands

### BRASSFOUNDERS TO BE ACQUIRED FOR £1,500,000

TWO take-over bids, totalling £1,500,000, have been announced by the Delta Metal Company, Limited, London, S.E.10. An offer has already been made for the 688,080 ordinary 5s. shares of Sperryn & Company, Limited, brass founders and finishers, of Birmingham, and negotiations for the acquisition of G. H. Edwards, a private company which manufactures plumbers' brassfoundry have reached an advanced stage.

The offer for Sperryn is one Delta 5s. ordinary share for each share held. Based on the closing price on Monday of 23s. 6d. for Delta shares, the bid is worth over £808,000. The Sperryn board is to send a circular to its shareholders as soon as possible.

The purchase consideration of G. H. Edwards will be satisfied by the issue of 500,000 Delta shares valued at £587,500 and a cash payment of £100,000. Delta states that it has no further acquisitions on hand or in prospect at the present time.

## UK and US Link in New Sales Company

SALES company, Simon-AMF, Limited, has been formed in the UK by Henry Simon, Limited, the flour mill engineering subsidiary of Simon Engineering, Limited, and the American Machine & Foundry Company, one of the largest makers of equipment for the baking industry. Henry Simon has for some time represented AMF in Britain for the sale of bakery equipment, but shortly the Simon subsidiary, T. & T. Vicars, Limited, will begin production of such machines.

At the same time the two companies have established a similar sales company on the Continent—AMF-Simon International, SA, with headquarters at Geneva, Switzerland. AMF is also building a research laboratory near London to undertake research in chemistry, physics, and electronics, as well as a factory at Whitstable (Kent) to make bowling-alley products for which there is a growing demand.

The formation of the companies coincided with the opening on Wednesday of new AMF headquarters in Savile Row, London. At the opening ceremony Mr. Gordon Jackson was appointed chairman of AMF, Maj.-Gen. G. D. G. Heyman and Mr. G. M. R. Lord, joint managing directors, and Mr. Adrian Legg and Mr. S. McLennan, directors.

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MINERALS SEPARATION, LIMITED—The company has purchased for redemption the whole of the £500,000 debenture stock at £90 per cent. There are now no debentures outstanding.

BARTON & SONS, LIMITED, tubing and conduit manufacturers, of Dudley (Worcs)—Interim dividend of 7½ (5) per cent. is to be paid on account of 1960. The increase has been made to lessen the disparity between the payments and does not imply an increased total dividend.

DUNSWART IRON & STEEL WORKS, LIMITED—Debenture holders have authorized the execution of a second supplemental trust deed to provide for redemption of debentures by December 31, 1960.

J. P. HALL & SONS, LIMITED, pump makers, of Peterborough—Group net profit fell sharply from £39,425 to £11,552 in the year to June 30, 1960, and the dividend is halved at 10 per cent.

W. TYZACK, SONS & TURNER, LIMITED—Final dividend of 8½ per cent. makes 12½ (10) per cent. for the year ended July 31, 1960. Net profit was £44,551 (£41,168), after tax of £45,096 (£38,863).

VAUGHAN BROS. (DROP FORGINGS), LIMITED—Final dividend of 12½ (10) per cent. makes 17½ (15) per cent. for the year ended June 30, 1960. Net profit was £30,155 (£15,782), after tax of £28,549 (£12,417).

THOS. HEITON & COMPANY, LIMITED, iron and coal merchants, of Dublin—Profit for the year ended July 31, 1960, was £48,716 (£28,151), before tax of £20,834 (£10,826), and the dividend is 12 (11) per cent.

CASTROL, LIMITED—Interim payment for 1960 is raised from the equivalent of 6d. to 7½d. per 10s. share on capital increased by a one-for-two scrip issue. The previous year's final dividend was equivalent to 1s. 4d. per share.

BENNIS COMBUSTION, LIMITED—As in the previous year, no dividend is to be paid for the year ended April 30, 1960. Group net loss was £14,975 (profit £908), after crediting tax recoverable £4,750 (tax charge of £3,000).

BROOKE TOOL MANUFACTURING COMPANY, LIMITED—The machine, jig, and fixture division of the company has been reconstituted as a new company—Brooke Tool Automation, Limited. The new company is a wholly-owned subsidiary.

E. CHALMERS & COMPANY, LIMITED, non-ferrous scrap merchants and ingot makers, of Leith—Final dividend of 12½ (10) per cent. makes 17½ (15) per cent. for the year ended August 31, 1960. Net profit was £32,735 (£25,844), after tax of £31,900 (£24,000).

GEO. ANGUS & COMPANY, LIMITED, power transmission, fire, gear and fluid sealing engineers, of Newcastle-upon-Tyne—Interim dividend for 1960 is raised from 5 to 7½ per cent. and the directors hope to increase the final dividend to 12½ (10) per cent.

WALKER BROS., LIMITED, constructional engineers, steel sheet makers, and galvanizers, of Walsall (Staffs)—In order to finance the extensions at the Warwick works, it is proposed to raise an additional £100,000 by a rights issue on favourable terms, yet to be decided.

ABERFORTH HOLDINGS, LIMITED—The financial year

has been altered to end on December 31 and the accounts will be presented at a general meeting in March or April. A resolution authorizing an increase in the company's borrowing powers to £6,000,000 has been approved.

BRITISH OXYGEN COMPANY, LIMITED—New company has been formed within the group to take over the business formerly carried on by Industrial Gases (Malaya), Limited. Known as Malayan Oxygen, Limited, it is expected to have an issued capital of $M 500,000.

NEWTON, CHAMBERS & COMPANY, LIMITED, iron-founders and engineers, of Thorncliffe, near Sheffield—An extra-ordinary meeting is called for October 13 to create capital to provide for the intended rights issue. The issue will be on a one-for-eight basis to holders of September 30.

MUIRHEAD & COMPANY, LIMITED, electrical engineers, of Beckenham (Kent)—An interim payment of 2½ per cent. on account of the year ending September 30, 1960, is announced, as forecast when the shares were marketed last July. A final dividend of 7½ per cent. was also foreshadowed.

WELLINGTON TUBE HOLDINGS, LIMITED—The offers to acquire all the 30,000 preference and 401,240 ordinary shares in Gibbons (Dudley), Limited, have been accepted by over 92 per cent. of both classes of holders and the offers have now been declared unconditional. The offers remain open for the time being.

ADA (HALIFAX), LIMITED—Mr. H. Kaye, secretary of the shareholders' committee, states that as a result of his open letter regarding the offer of Philips Electrical Industries, Limited, he has received a response representing 700,000 vote-bearing shares. This amounts to the 10 per cent. support which the committee had aimed at.

FLEXIBLE DRIVES (GILMANS), LIMITED, portable flexible drive tool manufacturers, of Smethwick—Distribution is being raised from 12 per cent. to 14 per cent. for the year ended March 31, 1960, with the addition of a 2 per cent. bonus. Group net profits rose from £12,166 to £14,717 after tax of £15,036 (£12,188).

METAL AGENCIES COMPANY, LIMITED—Interim dividend of 5 per cent. is to be paid on account of the year ending February 28, 1961, and the directors propose a one-for-six scrip issue. Last year the 5 per cent. interim dividend was followed by a one-for-five scrip issue and the total dividend was equivalent to 19 per cent.

STEWARTS AND LLOYDS OF SOUTH AFRICA, LIMITED (controlled by Stewarts and Lloyds, Limited, Glasgow)—Group sales increased by £2,460,000 to £16,660,000 in the year ended June 30, 1960. After all charges, including tax, the group net profit amounted to £816,912, compared with £735,418. The dividend is unchanged at 20 per cent.

CHUBB & SONS, LIMITED, manufacturers of locks, safes, etc., of London, S.W.1—In order that the dividend on the old preference shares may be kept in line with that on the 300,000 issued in July, it is intended in due course to declare a dividend for eight months on the old shares to be paid on December 1 at the same time as that on the new shares.

COLEY METALS, LIMITED—The issued share capitals of four companies have been purchased—A. A. Thornton (Teddington), Limited, general engineers, and its associated company, Thorkel Investments, Limited, and the City Casting & Metal Company, Limited, non-ferrous ingot manufacturers, of Birmingham, and its associated company, City Rolling Mills, Limited.

MIDLAND ELECTRIC MANUFACTURING COMPANY, LIMITED—An interest has been acquired in Pritchett Pty., Limited, switchgear manufacturers, of Sydney, with the object of producing and distributing the products of both companies in Australia. Mr. James Thornell, the company's Australian representative, is to join the board of Pritchett as the company's representative.

WILLIAM SUGG & COMPANY, LIMITED, engineers and non-ferrous founders, of London, S.W.1—Final dividend of 15 per cent. makes 22½ per cent. for the year ended June 30, 1960—an effective increase of 10 per cent. on the dividend for 1959, when, however, a non-taxable 2½ per cent. distribution was made. Group net profits rose from £29,328 to £62,519, after tax of £56,605 (£4,576).

LAKE & ELLIOT, LIMITED, makers of iron and steel castings, of Braintree (Essex)—Final dividend of 7½ (10) per cent. maintains 12½ per cent. for the year ended July 31, 1960. When the interim dividend was doubled to 5 per cent. holders were told that the final dividend was unlikely to be increased. Group net profit for the year fell from £174,977 to £177,385.

SHEEPBRIDGE ENGINEERING, LIMITED—The issued share capitals of Purfection Engineering Company (Coleshill), Limited, and its associated company, Station Engineering Company (Coleshill), Limited, have been purchased for cash. Purfection Engineering manufactures splines, gauges, and all forms of precision ground tools and gauges, and Station Engineering makes under licence Fulmer honing machines.

## WAGON MAKERS ARE SEEKING OTHER WORK

OTHER lines of manufacture are to be sought and developed by the Gloucester Railway Carriage & Wagon Company, Limited, owing to failure to obtain orders for rolling stock sufficient to keep the carriage and wagon works filled to more than a fraction of their capacity. The fall in the group net profit from £206,952 to £143,403 in the year ended May 31, 1960, is attributed to this failure by the chairman, General Sir William Morgan, who warns stockholders to expect a "severe" drop in this section's earnings in the current year.

Following the company's decision to make a financial investment in Winget, Limited, an endeavour is being made to develop other lines of manufacture as rapidly as possible.

## Price of Titanium Cut by Jessop-Saville

PRICES of its titanium products are to be cut by between 5 and 15 per cent. by Jessop-Saville, Limited, a member of the Birmingham Small Arms Company, Limited, group, and the second of the two large UK wrought titanium producers. Its chief competitor, Imperial Chemical Industries, Limited, which is estimated to control between 60 and 70 per cent. of the titanium market, recently announced reductions of between 10 and 15 per cent. from November 1.

Amount of Jessop-Saville's reductions will be in proportion to the finished stage of the product, but as a general indication the company announces that forged billet will be 12½ per cent. cheaper and rolled bar 15 per cent. The company has reduced its titanium prices several times in the past five years.

# IRON AND STEEL TRADE

DELIVERY dates tend to lengthen for most of the heavier products, and medium sections are in such demand that the mills are quoting into next year for orders now being placed. Industrial expansion at home accounts for most of the structural steel, joists, sections, and the newer kind of universal beams, but, in the unlikely event of a slackening in trade, a healthy export trade could be increased. Big stocks of ore and scrap are being carried, but these are not excessive for this time of year, especially having regard to the considerable output which will have to be maintained at the blast furnaces, steel plants, and rolling mills throughout the winter, when imports of foreign ore and the movements of scrap consignments can easily be affected by adverse weather conditions.

### Pig-iron

Although the recession in the motor-car industry continues to affect adversely many of its ancillary trades, up to the present the foundries supplying castings have not suffered any serious setbacks. The foundries continue to take up large quantities of pig-iron—the low-phosphorus irons heading the list.

From the furnaces now in blast total pig-iron production is at an estimated annual rate of 15,000,000 tons. Of this total about 85 per cent. continues to be taken up in basic pig-iron by the steelworks. Production of all the foundry grades of pig-iron is more than sufficient to meet current demands.

### Ferro-alloys

Most items are in good demand, with ferro-silicon business maintaining its interesting position. Although unchanged in price, ferro-tungsten is a little quieter, but there is a fair demand for ferro-molybdenum and ferro-vanadium.

Both the high and low carbon grades of ferro-chrome are quite active, and calcium-silicide receives steady attention. The demand for ferro-manganese and silico-manganese is at a good level.

### Semi-finished Steel

Good order-books for small bars and light sections are reported by the re-rollers and a heavy demand for reinforcing rods is maintained. It looks as if capacity output will be needed for some months to come. The biggest drawback being encountered is the shortage of suitable labour.

The shortage of carbon and alloy steel billets continues, but the call for the mild steel qualities can be met satisfactorily.

### Finished Steel

Pressure for cold reduced sheets has eased slightly, but the strong demand for small angles, flats, rounds, etc., persists and extended delivery dates seem generally to be the order of the day. The improved call for bright drawn bars of good commercial quality and cold rolled strip continues and reasonable delivery dates can be offered in most cases, but due to the lack of adequate supplies of raw material, special and alloy bright drawn bars are not too easy to come by.

Stockholders are doing a brisk trade, due no doubt to the fact that the steelworks are fully booked for some months ahead and are unable to accept spot lots for inclusion in current rollings, even to help out customers in difficulties. Makers specializing in colliery requirements would welcome a brisker demand and there is plenty of spare capacity in their programmes.

## Growth of Iron and Steel Imports

SOME idea of the capacity rate at which the British iron and steel trade has been producing in recent months is given by the Board of Trade figures for imports in the June-August period. Imports of iron and steel rose to a rate of £12,200,000 per month, 273 per cent. up on a year ago. In the first five months of the year, the rate was £7,400,000 per month, 155 per cent. up on the corresponding period of 1959. Imports of metal ores and scrap showed similar increases—£15,700,000 per month for June-August, an increase of 44 per cent., and £12,500,000 (50 per cent. increase) for the first five months of the year.

Iron and steel exports were at a substantially lower rate than earlier in the year, but still 11 per cent. in value more than a year earlier. This reflects mainly the growth of home demand, with the industry working at or near capacity.

## *New ECGD Facilities for Shipbuilders*

DETAILS of new facilities offered by the Export Credits Guarantee Department to UK shipbuilders were announced by Mr. Reginald Maudling, President of the Board of Trade, on Tuesday. In doing so he said: "I hope these facilities will prove of substantial assistance to UK shipbuilders in enabling them to tender competitively."

The new insurance policy for shipbuilders provides the same cover as before but at premium rates which may be as much as 50 per cent. below current rates. This will be achieved by linking with the insurance the security afforded by a ship mortgage, which considerably reduces ECGD's risk. In cases where the shipbuilder only requires cover from date of shipment, not more than 60 per cent. of the price is outstanding at that date, and where the mortgage is regarded as effective in the sense described, ECGD will provide cover against 95 per cent. of loss, as against the normal 85 to 90 per cent.

NEW PENSION SCHEME is to be introduced by G. & J. Weir Holdings, Limited, engineers and founders, etc., of Glasgow, as additional to the group's existing schemes. Eligible employees who join the new scheme will be contracted out of the State pension scheme, but all others will participate in the State scheme.

*Coalfield News*

# Down the Mine—With the BBC

THE medical profession, assorted social services, and the Press have all recently been the subject of television drama. Now it is the turn of coalmining. "Pay Day," the BBC's Sunday night play on October 16, is set in a coal mine and a Yorkshire mining village and is concerned with a group of men working together underground.

It is the first television play by 28-year-old Roderick Barry whose first ambition was to become a professional cricketer. After leaving school he worked on the ground staff of the MCC, taking an economics degree in his spare time. He then did his National Service in coal mining and his hopes of a career in sport were dashed when his back was broken in a fall of roof at the coal face. He has since trained as a film editor and writes in his spare time.

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COAL AND COKE SHIPMENTS from the South Wales ports last week totalled 54,563 tons—a gain of 10,581 tons on the previous week and of 14,058 tons on the corresponding period of 1959.

FIRE at the disused Blackrigg Colliery (West Lothian) last week was put out by water pumped from the pit bottom. The pithead framework which caught fire was in process of being dismantled.

STAY-DOWN strike at Coventry Colliery (Warwickshire) ended last Friday after four days. The strike was over a pay dispute and cost 8,000 tons of coal. At first 32 men were involved but only 15 remained below on Friday.

AT THE Mineworkers' Training Centre, Horden, 18 engineering apprentices from 7 collieries in the No. 3 (South-East Durham) Area of the Durham Divisional Coal Board passed the St. John Ambulance Association first-aid examination.

MR. WILLIAM WITHEY, 65-year-old shotfirer, has retired from Knockshinnoch Colliery, New Cumnock (Ayrshire), after 51 years in the mining industry. He started work in Burrockmill Pit, Ochiltree, and during his career has been employed in many local pits.

PRESENTATION was made recently to Mr. Edward McMahon (73) by Mr. R. D. Glass, general manager of the West Ayr Area of the Scottish Divisional Coal Board, in recognition of 60 years' service in the coal industry. Mr. McMahon spent most of his working life at Auchincruive Colliery.

MINERS at Kilnhurst Colliery who had been on strike since Wednesday of last week, returned to work on Monday. The strike had started when men in the Haigh Moor Seam claimed they were doing extra work without a proportionate wage increase. The men agreed to return to work pending negotiations.

OVER 1,000 leaflets were distributed to miners with their wages at Rothes Colliery (Fife) on Friday last in an attempt to check manpower wastage at the pit. Mr. T. D. Gibb, industrial relations officer of the East Fife Area of the Scottish Divisional Coal Board, said that men were leaving Rothes at the rate of 10 to 16 a week, which was far and away the worst wastage in the Area.

PROPOSALS BY the NCB which will allow former miners to receive their pensions in Co-operative Society vouchers has caused a strong protest by the National Union of Small Shopkeepers. The voucher-pension is one of four ways the board proposes paying pensions. The others are payment in cash at the collieries as in the past, direct by cheque, or into a bank account. The NUM is understood to support the voucher-pension scheme.

BETWEEN 40 and 50 ex-miners are likely to be homeless if they are evicted from their NCB houses, a meeting of Longbenton (Northumberland) Urban Council was told. Cllr. Hair said that it was not reasonable to expect the Northern (N&C) Divisional Coal Board to provide the men with homes when they had left the industry, but the Council decided to inform the board that it could not possibly provide alternative houses for the men.

MANAGEMENT COMMITTEE has been appointed to administer the Six Bells Colliery Disaster Fund and the draft trust deed that regulates the fund has been approved. Weekly payments will be paid to dependants and provision will be made for a full education for every child. The Public Trustee is to act as the fund's trustee and Mr. J. M. Beattie, of the Royal Insurance Company, Limited, Liverpool, is to be honorary treasurer. The fund is to close on March 31, 1961.

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# *Colliery Manpower's 8 Per Cent. Decline*

FALL in colliery manpower shows no sign of easing off. In fact the decline is slightly steeper than the average rate for the first 38 weeks of the year. In the week ended September 24, total manpower had dropped by 8.8 per cent. to 589,200 compared with 646,700 a year ago. The number of face workers was 10.8 per cent. fewer. The average weekly figures for the year so far are down on 1959 by 8.5 and 10 per cent., respectively.

There were 589,200 wage-earners on colliery books on September 24, against 646,700 on September 26, 1959, the numbers engaged at the coal face being 223,500 and 250,600 respectively. Total absenteeism (all workers) in the week ended September 24 was 14.78 per cent. compared with 14.81 per cent. in the week ended September 26, 1959. Output at the face was 3.971 tons and overall 1.397 in the week ended September 24, compared with 3.791 and 1.363 tons in the week ended September 26.

The following table gives (in tons) the output of saleable mined coal by division in the week ended October 1, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

| Division. | Week ended October 1, 1960. | | Week ended October 3, 1959. |
|---|---|---|---|
| | Total output. | Tonnage lost. | Total output. |
| Scottish .. | 332,400 | 19,800 | 356,000 |
| Northern (N&C) .. | 247,300 | — | 255,300 |
| Durham .. .. | 469,600 | — | 475,300 |
| North-Eastern .. | 806,700 | 10,600 | 853,500 |
| North-Western .. | 259,400 | 2,200 | 279,800 |
| East Midlands .. | 873,200 | 100 | 895,700 |
| West Midlands .. | 263,300 | 10,400 | 301,100 |
| South-Western .. | 373,900 | 7,900 | 413,800 |
| South-Eastern .. | 29,200 | — | 32,900 |
| Great Britain— | | | |
| Deep-mined coal .. | 3,655,000 | 50,000 | 3,863,400 |
| Other deep-mined (including licensed mines) .. | 39,500 | — | 56,400 |
| Open-cast coal .. | 144,800 | — | 187,100 |
| TOTAL .. | 3,839,300 | 50,000 | 4,106,900 |

# THE COAL TRADE

RAIL transport continues to give rise to some anxiety and delay in deliveries from the pithead, the situation being most acute in the Midlands. As was forecast there is no letting up in demand, and welcome though a brief respite would be, it is unlikely to come about this side of November 1. Adverse weather could aggravate the supply position still further and lengthen the waiting time that already exists for the majority of household qualities. Reports are received that more road transport is being pressed into service, but this can only be regarded as a gallant attempt to relieve the situation and by no means a satisfactory long-term solution.

### DURHAM AND NORTHUMBERLAND

The market, still affected by misgivings over the recent price increases is, however, fairly active, and certainly more so than it was a year ago. There is the feeling that the major industries will have to pass the increase on. There is sustained demand for Durham coking coal and industrial cokes, and power stations have taken larger quantities of lower grade sorts. This has helped to make some reduction in colliery stocks in the area.

Demand for electricity continues to mount in the region and the iron and steel industry has a substantial order-book for several months ahead. This, together with a consistent demand for better class Durham and Northumberland large and graded steams, has given the market greater stability.

The export section reflects a rather desultory tone and business is restricted to odd cargoes which are useful without being impressive.

### NORTH WALES

Merchants continue to indent for deliveries of all grades of house coal, pressure from householders showing no sign of abatement. Very little tonnage is available outside contract. A steady demand is experienced for "Coalite" and other smokeless fuels; deliveries are subject to several weeks' delay, however. All grades of anthracite are scarce. "Phurnacite" is also very difficult to obtain, despatches being about a month in arrear. Most merchants hold good stocks of all grades of coke.

The fuel requirements of industry are catered for quite satisfactorily.

## NCB Successes in Fuel Exams

OF the 18 National Coal Board employees who sat the City and Guilds examinations in advanced fuel technology in May, 16 were successful. Having now completed the three-year spare-time course they are eligible to become associate members of the Institute of Fuel.

Individual passes in the examination were as follow: Solid fuels: North-Western Division; E. Edgar, R. Frampton, F. Pennington, G. Cooke, J. R. Killoran, J. J. Barrett, F. L. Evans, E. Londsdale, K. Pover, K. Brown, W. A. Pedley. Northern (N&C) Division, R. Sewell. Durham Division, S. Parker (also a second class certificate for liquid fuel technology). West Midlands Division, T. R. Fawkes. Fuel plant technology: North-Western Division, J. Molyneux.

EXPANDED METAL COMPANY, LIMITED—A one-for-four rights issue of ordinary 5s. shares at 18s. 6d. is proposed to holders registered on September 27.

## Coal Chartering

NO improvement can be recorded in the coal markets and although some miscellaneous business has been effected from Hampton Roads the main interest is still for Japanese destinations. Reasonably large tonnage from the Roads to Japan was fixed at $8.40 for October 1/17 and 8,500 tons for October 1/25 at 10 cents extra, but a middle October 12,000-tonner has now been secured at $8.30. Rates, however, are somewhat irregular with the acceptance by charterers of 9,500 tons for October 25/November 15 at $8.50 and 11,500 tons for December at 5 cents extra. To South America 9,500 tons has been fixed to Rio for early loading at $.25 and Mobile/Santos 11,000 tons end of September/October at $5.95, but nothing has been reported to the Lower Plate. Newcastle, NSW, to Kawasaki and Fushiki reports 40s. f.i.o.t. for 11,000 tons, October 15/November 15.

The market from the UK is quiet but some demand is still noted for Mediterranean destinations and two vessels both about 4,000 tons for November and December loading have been fixed from Wales to West Italy at 24s. 3d. and from the Continent, Rotterdam/West Italy fixed 6,300 tons for September/October at 20s. Gdynia or Gdansk/West Italy paid 28s. 6d. for October 10.

South African Coal reports 46s. f.i.o. and trimmed Durban to Rangoon for 7,500 tons, November 1/30.

## PIT SAFETY OFFICER'S "IRONIC" DEATH

VERDICT of Accidental Death was returned at a Nailstone Colliery (Leicestershire) inquest on the pit's safety officer Mr. Tom Rigby (60), who was killed by a runaway loaded tub of sand underground at Nailstone. Mr. Rigby was standing talking to the manager, Mr. J. McPherson, and the group manager, Mr. W. C. Statham, who said in evidence that they had to jump for their lives. Mr. Rigby was pinned to the wall and killed.

Mr. James McHugh, representing the Colliery Officials and Staffs Association, commented that it was ironic that a man who had devoted most of his life to the safety of others should be killed in such a tragedy.

REVOLVO, LIMITED, London, W.2, which, for about 10 years, has been promoting the ball and roller bearing sales of RIV Officine di Villar Perosa, S.p.A., Turin, Italy, is to open a Glasgow office. Revolvo is a member of the Kenning Motor group.

# *Vital Importance of Commonwealth Trade*

TRADE with the Commonwealth was of such importance to Britain that it would be suicidal to do anything that would substantially curtail these markets, said Sir William McFadzean, president of the Federation of British Industries, on Monday.

SIR WILLIAM MCFADZEAN

Sir William, who is chairman and managing director of British Insulated Callender's Cables, Limited, was speaking at the opening session of the fourth International Conference of Manufacturers. Any regional economic grouping should always aim to create wider and freer trade, rather than to restrict or confine it to sealed compartments. It would be little short of tragic if fresh barricades were to be raised after so much patient work had been done over the past 15 years in attempting to encourage an easier flow, he said.

Economic regionalism was a comparatively new development and they must recognize that the scale and scope of modern industry required markets spilling over national boundaries. The emerging and developing countries had been caught up in the revolution of rising expectations and were impatient for progress. "If they cannot look to us for help then we cannot blame them if they look elsewhere. Mere charity is not enough. We must be accepted as partners in furthering all their plans."

Regarding East-West trade relations, Sir William said that mounting competition was likely not only in terms of trade but in offers of credit loans and other politic-economic blandishments to the whole uncommitted and emergent world. "We cannot afford to ignore the enigma of the Sino-Soviet block with its immeasurable economic potential and its vast population," he said.

## LAYCOCK REVISES HARDYPICK OFFER

FOLLOWING discussions between the boards of Laycock Engineering, Limited, and Hardypick, Limited, the Laycock offer of 30s. per preference and 65s. per ordinary share in Hardypick has been revised. The new offer is 31s. per 7 per cent. cumulative preference share and 85s. per £1 ordinary share. Holders who accepted the original offer will receive the revised consideration.

The Hardypick directors have undertaken to accept the revised offer in respect of their own shares and strongly recommend other shareholders to do the same.

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CHURCHILL GEAR MACHINES, LIMITED, is to extend its works and erect new offices at Blaydon (Co. Durham).

# Clean Air Conference

PRAISE for the efforts industry was making, often at considerable expense, to reduce air pollution, was given by Sir Hugh Beaver in his presidential address to the annual conference of the National Society for Clean Air which opened at Harrogate on Wednesday. Progress, not as rapid as had been hoped, was being made, he said. All new power stations were virtually smokeless, with a very high performance grit arrestment plants and high chimneys —up to 600 ft.

The iron and steel industry had embarked on a very costly campaign to deal with emissions from ore driers, sinter plants, blast furnaces, and the new techniques of steel production. The coking industry had a working party with the Alkali Inspectorate to investigate the problem of "gren gas" from the charging of coke ovens. The bottle oven kiln of the Potteries was rapidly giving way to smokeless techniques.

On the domestic smoke problem Sir Hugh said: "There may well, in due course, be developed domestic heating appliances which can safely use many of our raw coals without nuisance and without skilled, or at least without skilful and continuous, attention. But these have not yet been developed. So if we believe in clean air . . . we must accept that there must in due course be some control over all domestic firing appliances wherever people are thickly congregated; or over the fuel used—or both.

"In industry it is as we know perfectly possible to use in nearly all boilers and furnaces the poorest of coals so as reasonably to fall within the Act. This is not so and probably never can be the case with the domestic hearth," he said.

The conference is attended by some 1,000 delegates from local authorities, national associations, firms, medical men, and technologists.

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# *Mines Safety Establishment's "Open Day"*

BIGGEST "open day" since the war at the Ministry of Power's Safety in Mines Research Establishment at Harpur Hill, Buxton (Derbyshire), was held on Thursday of last week. From all over the country 300 safety officers and safety engineers from the mining, chemical, and petroleum industries, and other industries subject to explosion hazard, went to watch the all-day programme of demonstrations. The visitors were welcomed by Mr. H. T. Ramsay, the director, and Mr. W. F. Richardson, NCB chief safety officer, replied.

Mining explosives and flameproof electrical apparatus for use in mining and other industries were demonstrated and the visitors saw something of the research into dust and gas explosions and the detection, prevention, and suppression of underground fires carried out at SMRE. The establishment's new "visual-aid" exhibition—which shows by means of diagrams, models, and high-speed photographs, the practical application of the work carried out at SMRE—was shown for the first time. Its public debut will be at the jubilee exhibition of the Association of Mining Mechanical and Electrical Engineers at Cardiff in November, after which it will tour the country.

# NEWS IN BRIEF

WAGES OF Ruhr mineworkers were raised by 4.5 per cent. from Saturday. A further increase of 5 per cent. of the rates then in force is planned for July 1, 1961.

STEEL PRODUCTION in the US this week is estimated at 1,500,000 tons, compared with 1,558,000 tons last week and 362,000 tons in the corresponding week of last year.

THREE-YEAR development plan requiring some DM200,000,000 of additional funds has been announced by the Rheinische Stahlwerke coal and steel group, of Essen.

THE NAME "UNDERSEAL" has been registered as a protective trade mark for rubberized under-body protective coating by Minnesota Mining & Manufacturing Company, with effect from June 23, 1955.

VOKES, LIMITED, Guildford filtration and silencing engineers, has changed its name to Vokes Group, Limited, and a new subsidiary, Vokes, Limited, has been incorporated to take over the business of Vokes.

SOME 3,000 tons of galvanized steel tubes, worth a total of $3,600,000, are to be exported by a Taiwan ferrous metals concern to Hongkong. This is the first export order of its kind for Formosa, which until now has had to import galvanized tubes itself.

NEGOTIATIONS for the take-over of the Royal Ordnance Factory at Fazakerley, Liverpool, by Joseph Lucas (Gas Turbine Equipment), Limited, are nearing completion. As far as the Corporation was concerned, the deal could be completed, said Ald. J. Braddock.

A COAL-PROCESSING PLANT with an initial annual capacity of 1,000,000 metric tons is to be brought into operation at the Rumanian coal centre in the Jiu Valley. The unit, to be delivered by Czechoslovakia, will have an eventual annual throughput of 3,000,000 metric tons.

FRENCH SUBSIDIARY is to be set up by Whessoe, Limited, designers and builders of capital plant for the gas, chemical, and oil industries, of Darlington. A factory is to be built at Calais for the production of accessories, such as valves and pumps, for the storage of gas, oil, and other fluids.

EAST GERMANY announces that over the first half of the current year the national output of pig-iron has risen by 4 per cent. on the corresponding period of 1959 to a total for the period of 978,700 metric tons. Raw steel production rose by 3 per cent. to 1,638,200 metric tons for the first half of 1960.

FOUR EMPLOYEES of Ruston & Hornsby, Limited, engineers, steel and iron founders, of Lincoln, were presented with gold medals, gold watches, and certificates on Tuesday. The presentations, which were made by the joint managing director, Mr. V. R. Prehn, marked 50 years' service with the firm.

A RECONSTRUCTED DOCK at the Birkenhead yard of Grayson, Rollo & Clover Docks, Limited, will handle vessels of up to 65,000 tons. At the official opening on Wednesday, Lord Carrington, First Lord of the Admiralty, said the Navy was still the largest single customer of the shipbuilding industry.

A SCHEME for making cash payments to male employees on their retirement at the age of 65 has been introduced by Smith's Dock Company, Limited, Tyne and Tees shipbuilders and repairers. The scheme is non-contributory and concerns those not involved in the firm's pension scheme.

HALF-WAY MARK has been reached on the construction of a new phosphoric acid plant for the National Phosphate Corporation at Marseilles, Illinois, USA. The plant was designed by Chemical Construction Corporation, New York, and will process phosphate rock from Florida by the "wet process."

"IN THE GENERAL interest of all its employees," Turner & Newall, Limited, has decided not to contract out of the new State pension scheme. The company's private pension schemes, covering all classes of employees, will be retained in their present form so that employees will benefit from both schemes.

TRADING of the Quasi-Arc Company, Limited, is to be carried out in the name of the parent company, British Oxygen Company, Limited, to which all assets have been transferred. Quasi-Arc will act as agents for British Oxygen until December 31, however, and invoicing will continue in the present name until then.

THE Federation of British Industries and the British Employers' Confederation will be joint hosts to 210 leading Western industrialists attending the fourth International Conference of Manufacturers organized by the Council of European Industrial Federations at the FBI headquarters in London, from October 3 to 6.

PRESENTATIONS were made on Tuesday to five employees of W. T. Flather, Limited, steelmakers, of Sheffield, by Mr. D. G. Flather, the managing director. They had each completed 25 years' service and thus qualified for entry to the company's Twenty Five Club, which was founded three years ago and now has 54 members.

WORLD SELLING RIGHTS have now been assumed by Pyrotenax, Limited, for its mineral insulated copper covered cables which have previously been subject to licence agreements and only sold in the UK and Commonwealth. Under the new agreement with the original licensors, both French concerns, Pyrotenax will sell the products of French, Canadian, and Australian factories, as well as of that at Hebburn.

WRITING IN THE firm's works magazine, Mr. R. W. Mann, managing director of Victor Products, Limited, Wallsend, states that it is proposed to develop the manufacture of drill steels as a regular item of production. This step has been necessary owing to a falling-off in orders for the coal-mining industry. Mr. Mann says that during the next six months, considerable expenditure will be incurred in connection with the new venture.

ONE-DAY CONFERENCE to assist in the selection of fuel for industrial plants is to be held at Hulme Hall, Port Sunlight, by the Federation of British Industries on October 19. Speakers will be drawn from the coal, gas, electricity, and oil industries and an independent assessment will be made by Mr. Walter Goldstern, a fuel technologist, of Leeds. The speakers will then form a panel to answer questions on any aspect of fuel utilization from the conference, which is open to non-members of the FBI.

SHAREHOLDERS' COMMITTEE representing the holders of nearly 1,500,000 shares, or about 14 per cent. of the capital of Ada (Halifax), Limited, has requisitioned an extra-ordinary meeting. Mr. H. Kaye, secretary of the committee, said on Monday that documents were with Counsel with a view to considering making an application to the Board of Trade for an investigation into the company's affairs. Philips Electrical Industries, Limited, declared its offer of 3s. 9d. per 1s. Ada share unconditional on Monday.

# British Embassies Think Commerce "Non-U"

"COMMERCE is still thought to be 'non-u' in many of our embassies abroad whereas it should be in the forefront of our foreign activity if we are to emulate our more successful rivals," states Mr. John V. Sheffield, chairman of Horseley Bridge & Thomas Piggott, Limited, constructional engineers, bridge builders, ironfounders, etc., of Tipton (Staffs), in his annual report. Mr. Sheffield urges the improvement of the commercial activities of Britain's foreign service, maintaining that the help and assistance given by the accredited representatives of many other countries is far beyond anything normally available to the British exporter.

"Our Government must bring about conditions where it pays industry to export," he insists. "This should not be done by the frustrating use of controls to damp down home trade, but by the positive use of taxation reliefs and a more flexible supply of export credits. By such methods, that of the carrot, rather than the stick, a real enthusiasm for exports would be developed throughout industry."

Foreseeing throughout the world a considerably greater capacity than demand in conventional structural steelwork and particularly platework for some time to come, Mr. Sheffield says that in the future the policy for all the companies in the group will be towards greater diversification and more specialized products.

## *Stone Dust Barriers*

MADE by the Minister of Power under the Mines and Quarries Act, 1954, the Coal Mines (Precautions against Inflammable Dust) Regulations, 1956, relate to the precautions required to be taken at coal mines to minimize the amount of inflammable dust in, or which could be raised into, the air below ground.

The Coal Mines (Precautions against Inflammable Dust) (Variation) Regulations, 1960, which came into operation on October 1, vary these earlier regulations by introducing a new regulation, 10A, requiring the manager to ensure the provision and maintenance in certain areas of mines of coal of stone dust barriers in or near to roads on which coal (other than anthracite) is carried by means of certain conveyors. The manager must prepare a scheme in respect of each area specifying the position and type of each barrier in the area, and he can be required to amend the scheme by an inspector who thinks it advisable for reasons of safety.

## Underwater Pipeline for RTB

LONGEST underwater effluent pipeline to be laid in Britain has recently been completed at the Spencer Steelworks of Richard Thomas & Baldwins, Limited, at Llanwern (Mon). The pipe is 18 in. in diameter and runs for one and a half miles from the works to the bed of the Bristol Channel. The whole operation took seven months and cost £150,000.

The work was carried out by Land & Marine, Limited, a Dutch company which specializes in such work.

METROPOLITAN-CAMMELL CARRIAGE & WAGON COMPANY, LIMITED—Sir Ralf B. Emerson has joined the board.

# *23 ECSC Steel Firms Top 1,000,000 Tons*

FIGURES issued by the High Authority of the European Coal and Steel Community in Luxembourg show that last year 23 separate steel concerns within ECSC produced over 1,000,000 metric tons of raw steel annually. Of these, 11 were in West Germany (including the Saar), four in France, three in Belgium, two each in Luxembourg and Italy, and one in Holland. Biggest producer, with 3,150,000 tons, was August Thyssen-Hütte AG, of Germany, followed by Arbed, Luxembourg, with 2,950,000 tons.

Tonnages for other steel concerns were: de Wendel (France) 2,500,000, Phoenix-Rheinrohr (Germany) 2,400,000, Usinor (France) 2,400,000, Dortmund-Hörder Hüttenunion (Germany) 2,260,000, Mannesmann (Germany) 2,100,000, Sidelor (France) 2,070,000, Rheinhausen (Germany) 2,050,000, Cockerill-Ougrée (Belgium) 2,040,000, Lorraine-Escaut (France) 1,870,000, Klöckner (Germany) 1,820,000, Hoesch (Germany) 1,800,000, Oberhausen (Germany) 1,700,000, Ilva (Italy) 1,450,000, Hoogovens (Holland) 1,400,000, Salzgitter (Germany) 1,330,000, Providence (Belgium) 1,220,000, Völklingen (Germany) 1,150,000, Hadir (Luxembourg) 1,100,000, Bochumer Verein (Germany) 1,080,000, Hainaut Sambre (Belgium) 1,050,000, and Cornigliano (Italy) 1.010,000. The 23 companies together produced 66.5 per cent. of the total ECSC steel output of 63,160,000 tons last year.

## Junior Institution of Engineers' Awards

COUNCIL of the Junior Institution of Engineers has awarded its gold medal for 1959-60 to Mr. D. E. Edminson for his paper, "Some Aspects of Industrial Space Heating." The institution's silver medal has been awarded to Dr. F. T. Barwell for his paper "Adhesion Between Wheel and Rail," and the north-western section silver medal to Mr. D. H. Clarke for "Fitting an Escalator in a Ship."

Other awards were as follow: Vickers medal and prize; Mr. John Heywood for his paper, "The Design Features of Large Radio Telescopes." Tookey award, Mr. L. A. Waight for his paper, "Milk Production and Processing." Dunn medal: Mr. Hubert J. N. Riddle for his lecturette, "Some Recollections of Past Secretary H. G. Riddle as a Model and Experimental Engineer."

## *Machine-tool Order-book in July*

ORDERS obtained by the machine-tool industry in July totalled £14,500,000. This is nearly three times the figure of £5,200,000 for July, 1959, and is £4,200,000 more than the figure for June, 1960. The increase in the rate of new export orders was slower than that for home orders.

The industry's total order-book at the end of July stood at £93,200,000, against £81,700,000 at the end of June and £49,200,000 a year previous.

MEMBERS OF THE STAFF of J. R. Forrester & Company, Limited, engineers' furnishers and steel stockholders, of Paisley, are to receive a bonus to mark the company's jubilee.

# Here's Air Power at ROCK BOTTOM cost

## ER6 Heavy-Duty Compressor for reliable 3-shift operation

Atlas Copco's ER6 compressor delivers air at the lowest possible cost. Designed to incorporate *every* economy factor, it combines the lowest possible running costs with low installation costs and a space saving design.

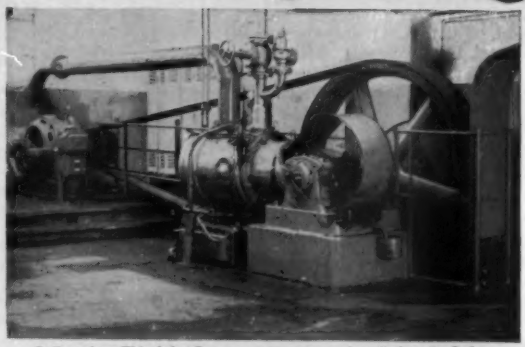
The ER6 delivers 1,075 cfm at 100 psi (30.4m³/min at 7 kg/cm²) for a power consumption that is absolutely rock bottom. Thanks to a new type of intercooler, water consumption is only 440 imperial gallons (2,000 litres) per hour—a *quarter* the consumption of most similar machines. The ER6 is compact. Occupying only half the space usually required for machines of its capacity, it saves expensive factory space. In addition, installation costs are lower as new, cheaper installation methods are employed.

***RANGE OF STATIONARIES***

From 2.5 to 20,000 cfm, there is an Atlas Copco stationary compressor to suit every requirement. Whatever the design factor—compactness, low installation cost, low operating cost, or a combination of all three—Atlas Copco stationaries are high-performance machines you can rely on.

**Sales and Service in Ninety Countries**

Represented in ninety countries, Atlas Copco is the world's largest organisation specialising solely in compressed air equipment. Products include stationary and portable compressors, rock drills, loaders, hoists, air tools and paint-spraying equipment. Wherever you are, the international Atlas Copco group offers expert advice and provides a complete after-sales service.



Built to last. This Atlas Copco compressor was installed at the Bofors engineering works (Sweden) in 1907. It is still in operation.

*WRITE FOR THE LEAFLET* Leaflet E1127 gives full details of the ER6 compressor. Write for a copy to your local Atlas Copco company or agent or to the address at the foot of this advertisement.

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## *Law Cases*

### FINE OVER "LIVE" POWER TOOL

FINE of £200 was imposed on Dudley & Dowell, Limited, ironfounders, of Cradley Heath (Staffs), at Rowley Regis Magistrates' Court, for failing to earth securely a portable electric sand turning machine. It was stated that Lawrence John Walker (17) received a shock from the machine from which he died.

Mr. D. H. Livesey, prosecuting, said an operator was working the machine, which was used to turn sand after castings had been knocked out. Current was carried to it by a 100-ft. cable. The machine was not switched on, but current was in the cable. The youth, Walker, saw the operator trying to pull the machine from one gangway to another, and got hold of the front of it to help him. He suddenly collapsed, and another workman who went to his aid was thrown backward by a shock.

The operator had been holding the rubber-covered handle and was therefore unharmed. After the accident, said Mr. Livesey, it was found that the cable had been caught in the chain and sprocket drive and as a result the machine was "live." The earth was hanging loose, and the earth leads to the machine were loose and insecurely fixed.

Mr. G. F. Davies, for the company, which pleaded Not Guilty, said the firm's instructions that when the machine was moved the cable should be taken from the plug, wound up, and put on the machine, had not been carried out.

### DEATH FOLLOWED BREACH OF RULES

COLLIER who ignored a prohibitive notice and crossed a moving conveyor belt, died eight days afterwards after losing both legs. An inquest jury, acting on the advice of the Monmouthshire coroner, Col. Kenneth Treasure, returned a verdict of Accidental Death on Mr. Reginald T. W. Jones (45).

Mr. Jones, it was stated, was following another miner across the stationary belt when it started and he was trapped between the belt and the skirtplate. It was stated that signs were exhibited in the mine prohibiting the crossing of the belt other than by a footbridge.

### YOUTH INJURED BY CRANE

AT Ayr Sheriff Court an agent for the Scottish Stamping & Engineering Company, Limited, drop-forgers and stampers, of Ayr, admitted a contravention of the Factories Act by failing to ensure that a crane did not approach within 20 ft. of a place where a person was working. The firm was fined £20.

The case was the sequel to an accident in which an apprentice lost part of two fingers when an overhead crane in the company's Ayr factory was moved across the wheel track where the youth was working on a ladder.

### URGENT ORDER LED TO FINE

IN order to complete an urgent export order a power press at the Steetley works of the Oughtibridge Silica Brick Company, Limited, was operated without a fixed guard in position. For failing to cause dangerous machinery to be securely fenced the company was fined £75 with 8s. 6d. costs at Worksop Magistrates' Court.

The press was used to make the metal casings for a new metal-clad refractory brick recently developed by the company. An interlocking guard was provided for the machine, as recommended, but it was found that the machine did not have the necessary attachments for it. While working the press an employee was injured.

The chairman, Cllr. A. J. Eastland, said that bearing in mind the circumstances the magistrate had imposed the lowest possible fine.

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INLAND REVENUE is to appeal against the Chancery Court decision by Mr. Justice Pennycuick last May in favour of Rolls-Royce, Limited, that payments by foreign Governments or companies for "know-how" to enable them to manufacture Rolls-Royce engines locally were capital payments and therefore not taxable. The case concerned assessments on the company's profits amounting to over £15,000,000 for the years 1948-55.

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## Miners' Leader on Wages and the Price of Coal

SUGGESTIONS that the increases in the price of coal this month could be attributed to the recent wage award to miners were described as "misleading and preposterous" by Mr. Abe Moffat, after a meeting in Edinburgh last week of the Scottish Area of the National Union of Mineworkers, of which he is president. He urged Scottish miners to repudiate these suggestions, and to conduct local campaigns to bring home to the public the situation now facing the industry.

Mr. Moffat said the cost of the wage award was about £4,000,000, or about 5d. a ton, whereas the National Coal Board had increased coal prices to industrialists by 6s. 8d. a ton and to domestic users by 10s. a ton, yielding £60,000,000. "This arises from the Government's policy of discrimination against the coal industry by giving preference to the oil monopolies, who are making huge profits," he said.

Mr. Moffat described miners as the "Cinderellas of the 'sixties," and said the Scottish executive of the NUM would press for a substantial increase in wages for all day-workers. It will also ask the national executive to call an early coalfield conference, at which an attempt will be made to seek amendment of the conciliation machinery to eliminate compulsory arbitration.

"The mining industry is now facing a serious manpower crisis," Mr. Moffat said. "Unless steps are taken to provide greater security and improved wages and conditions, we will be faced with a situation that will not only affect the mining industry, but, sooner or later, the whole economy of the country."

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## NEW TINPLATE PRODUCTION FIGURES FOR SCOW

TINPLATE division of the Steel Company of Wales, Limited, set up new production figures last month. At Velindre, during the week ended September 24, the five-stand mill rolled 11,339 tons of strip, 572 tons more than the previous best. In the same period the electrolytic tinning lines produced 213,000 boxes of tinplate, an increase of 5,000.

During the week ended September 17, the five-stand mill at Trostre created a record production figure of 11,570 tons, 266 tons more than the record set up in 1958.

Foundation for a blast furnace in Refractory Concrete, cast as a Cylindrical boss of 32 ft. 6 in. diameter and 9ft. depth.

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**to ensure maximum protection to the underlying structural foundations and also**

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*(an iron-free white calcium-aluminate cement)*

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Higher Temperatures up to 1800°C.

Reducing Atmospheres.

Resistance to Slag attack.

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*Write for booklet "SECAR 250".*

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AP/59

# CURRENT PRICES OF IRON AND STEEL

*(Delivered, unless otherwise stated)*
October 6, 1960

## PIG-IRON

**Foundry and Forge Iron.**—No. 3 iron, Class 2, Middlesbrough, £21 6s.; Birmingham, £20 18s. 3d., 10-ton lots or over.

**Low-phosphorus Iron.**—Over 0·10% to 0·40% P, 10-ton lots or over, £23 5s., delivered Birmingham, £23 10s., delivered Grangemouth.

**Basic Pig-iron.**—Delivered in Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics, 10-ton lots or over, £20 3s.

**Hematite.**—Si up to 2%, S & P 0·03-0·05%: N.-E. (local iron), £23 19s.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 7s. 6d.; Birmingham, £25 14s.; Wales (Welsh iron), £23 19s., 10-ton lots or over in each case.

**Refined.**—Cylinder and refined irons, South Zone £25 9s., North Zone £25 6s. 6d. Refined malleable, max. 0·10% P. South Zone £26 9s., North Zone £26 6s. 6d.

## MANUFACTURED IRON

*(Bar basis, 2½ in. to ¼ in.)*

CROWN IRON: England and Wales (Zone 1), £48 10s.; Scotland, £48 5s.; Ireland, f.o.q. Belfast, £50 7s. 6d.; all other Northern Ireland ports, £50 10s., f.o.q. Cable iron, £1 extra.

## SEMI-FINISHED STEEL

**Re-rolling Billets, Blooms, and Slabs.**—BASIC: Soft, u.t., 100 tons and over, £31 15s. 6d.; tested, 0·08-0·33% C, 6 to 35 tons, £33 15s. 6d.; hard (0·41-0·60% C), under 10 tons, £34 17s.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting steel up to 0·25% C, under 10 tons, £36 14s. 6d. SIEMENS-MARTIN ACID (under 10 tons): Up to 0·25% C, £41 1s.; silico-manganese, £44 4s.

**Billets, Blooms, and Slabs for Forging and Stamping.**—Lots of under 10 tons. Basic, soft, up to 0·33% C, £38 10s.; basic, hard, over 0·41 up to 0·60% C, £39 12s. 6d.; acid, up to 0·25% C, £43 4s.; acid silico-manganese, £46 7s.

**Alloy Steel** (5 tons to under 10 tons).—BILLETS, 3 in., up to and including 10 in., for re-rolling, 0·6/1% Ni, £47.; Ni 2·75/3·75%, Cr 0·5/1·10%, £73 17s.; Ni 2·75/3·75%, Cr 0·5/1·3%, Mo 0·2/0·65%, £84 7s. BARS: 1 in. dia. and up, nickel, £67 17s.; nickel-chrome, £98 11s.; nickel-chrome-molybdenum, £111 4s.

**Other Semi-products, etc.**—Forging ingots, up to 0·60% C, £31 12s. 6d. f.o.t.; tube billets, under 10 tons, £40 10s.; shell steel billets for direct forging up to and including 0·33% C, 100 tons and over, £37 15s.; tin bars and sheet bars, 50 tons and over, £32 10s. Wire rods, 3g. to 4g. (all areas except Birmingham, Scotland, Southern Joint Area, and Northern Ireland): Soft basic, under 50 tons, £41 2s.; hard basic, under 10 tons, £44 8s.; free-cutting, up to 0·25% C, under 10 tons, £46 12s.; acid, up to 0·75% C, under 10 tons, £54 14s. 6d. Stainless steel billets, 3 in. and over, 5 tons to under 10 tons, Austenitic, £229 10s.; martensitic, £141 10s.

## FINISHED STEEL

**Heavy Products** (1 ton to under 10 tons).—Mild-steel plates, ordinary qualities, N.-E. Coast and Northern Joint Areas and Central Scotland, £41 12s.; medium plates, all areas of England and Wales, £45 1s. 6d.; boiler plates, N.-E. Coast and Northern Joint Areas and Central Scotland, £44 2s.; floor plates, N.-E. Coast, £43 1s. Sections (N.-E. Coast, Midland, and Northern Joint Areas, and Central Scotland): Angles, £38 16s. 6d.; bars (rounds and squares), £41 6s. 6d.; flats, £39 1s. 6d.; joists, £38 12s. 6d.

**Rolled and Re-rolled Steel Products.**—N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over: Angles and tees, 4 in. and under, £40 18s. Channels, 3-in. web and under, £40 18s. Flats, 5 in. wide and under, and rounds and squares, under 3 in.: Untested soft basic, £39 1s.; free-cutting, £45 1s. 6d.; hard basic, £41 19s. 6d.; Siemens Martin acid, £49 0s. 6d.; spring steel, basic, £44 4s. 6d. spring steel, acid, £52 19s. Glazing tees, £47 0s. 6d. Sash and casement sections, £43 13s. 6d. Gate channels, £50 17s. 6d. Ferro-concrete bars (10 tons to under 500 tons), £39 10s.

**Sheets and Strip.**—Uncoated strip mill coils, hot rolled, under 3 mm. to 12g., mill run, mill edge, 25 tons to under 50 tons, £43 16s.; cold reduced, 17/20g., side trimmed, skin passed, £49 16s. Black sheets, 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 18s. Cold-rolled steel strip, coils, hard temper, not annealed, 10 tons to under 20 tons, £55 5s. Hot-rolled hoop and strip, u/t soft basic, 100 tons and over, £38.

**Tinplates.**—Cold reduced, hot dipped, 15 tons to under 50 tons, 66s. 8d. per basis box of 108 lb., f.o.t. makers' works. Cold reduced electrolytic, 59s. 9d. per basis box.

**Colliery Rails and Arches.**—Arches, 4 in. × 2½ in. × 2 in. re-rolled £39 15s., 3 in. × 3 in., re-rolled £40, 3½ in. × 3½ in., re-rolled £40 7s. 6d., 4 in. × 2½ in. × 2 in., prime £44 6s. 9d. Other sections, prime £44 11s. 9d. Extra fishplates, £52 10s. Cambered girders, 4 in. × 2½ in. × 2 in., re-rolled £38 9s., 3 in. × 3 in., re-rolled £38 11s. 6d., 3½ in. × 3½ in., re-rolled £38 18s. 6d., 4 in. × 2½ in. × 2 in., prime £43 4s. Other sections, prime £43 6s. 6d. Benk bars, standard type, prime material, all thicknesses, £38 11s.; re-rolled, up to ¾ in., inclusive, £37 6s.; over ¾ in., £38 11s. "W" type bars, prime steel, all thicknesses, £41 1s.; re-rolled, up to ¾ in., inclusive, £39 16s.; over ¾ in., £41 1s.

**Bright Steel** (10 tons to under 20 tons).—Bars, no analysis or test, £52 8s. 6d.; flats, untested, £70 3s. 6d.

**High-speed Tool Steel.**—Finished bars, 5% cobalt, 10s. 10d.; 14% tungsten, 6s. 11d.; 18% tungsten, 7s. 9d.; 22% tungsten, 9s. 2d.; 4/6 quality molybdenum tungsten, 6s. 3d.; 6/6 quality molybdenum tungsten, 6s. 5d.; 5/6/2 quality molybdenum tungsten vanadium, 6s. 7d. per lb.

**Rails, etc.**—F.B. rails, heavy, 75 lb. to under 90 lb., 500 tons and over, f.o.t., £39 15s.; fishplates for rails 80 lb. and over, 50 tons and over, f.o.t., £53 11s.; soleplates, f.o.t., 100 tons and over, £51. Light flange rails, 25 lb. and under, d/d N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over, £40 17s. 6d.; fishplates for light rails, 50 tons and over, £50 12s. 6d.

## BLAST-FURNACE COKE

*(F.O.T. at Ovens)*

DURHAM AND NORTH-EAST COAST: 177s. 6d. SOUTH WALES: 174s. 7d. NOTTS AND DERBY: 150s. 7d. LANCASHIRE: 162s. 7d. STAFFORDSHIRE: 156s. 2d. YORKSHIRE: 155s. 1d SCOTLAND: 187s. 11d.

(All prices are subject to quality differentials.

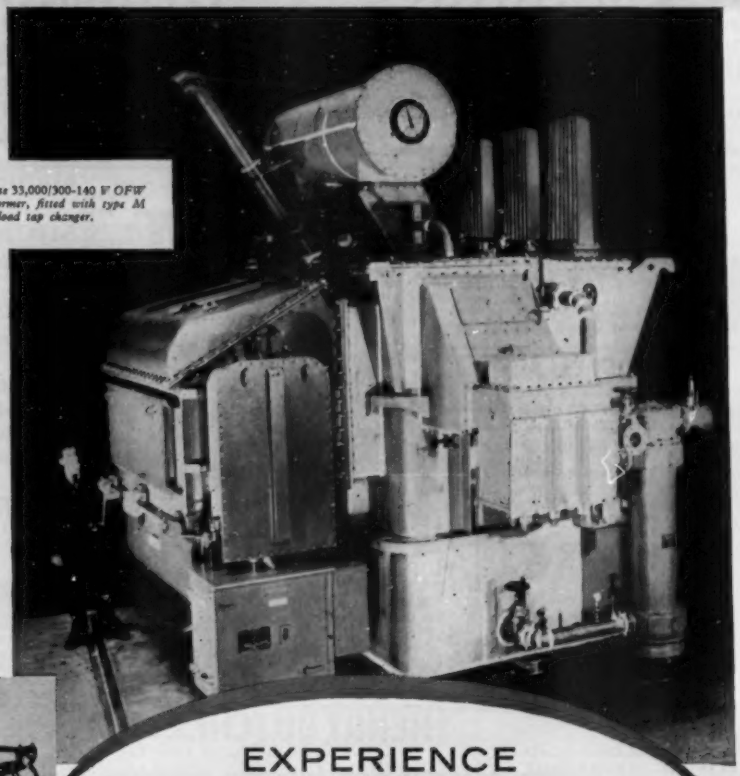
## STEELWORKS SCRAP

(Plus 5 per cent. in the case of sales by merchants.)

| | Scotland. | N.-E. Coast. | Midlands. | Sheffield. | Lancs. | S. Wales (East) | S. Wales (West) |
|---|---|---|---|---|---|---|---|
| | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| Heavy steel scrap* .. | 229 3 | 228 3 | 220 0 | 226 3 | 226 3 | 227 3 | 232 3 |
| Heavy mixed scrap* .. .. | 207 3 | 206 3 | 198 6 | 204 3 | 203 9 | 205 3 | 210 3 |
| Heavy steel turnings† .. .. | 179 9 | 179 9 | 169 9 | 176 9 | 174 3 | 177 0 | 180 0 |
| Heavy cast iron† | 206 9 | 203 9 | 208 0 | 204 3 | 189 3 | 199 3 | 205 9 |
| Cast-iron borings† | 160 3 | 157 3 | 157 0 | 159 9 | 157 3 | 159 6 | 164 6 |

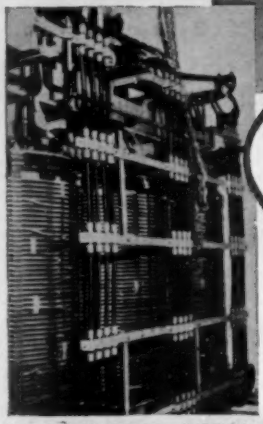
* Basis 500-ton lots in England and Wales and 250 tons and upwards in Scotland, delivered.

† Not less than 250 tons in England and Wales, 100 tons in Scotland.



*A 10,000 kVA, 3-phase 33,000/300-140 V OFW cooled furnace transformer, fitted with type M resistor transition on-load tap changer.*

PHOTO BELOW *by courtesy of N.V. Ned. Kabelfabrieken, Alblasserdam.*



**AFTER TEN YEARS' SERVICE**

*This illustration shows the excellent condition of the windings and connections of a 7,500 kVA, 3-phase, 12,500/234-92 V furnace transformer, removed from its tank for inspection after 10 years' service in Holland.*

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# AEI ARC FURNACE TRANSFORMERS

Over twenty-five years' practical design and development experience lie behind the arc furnace transformers being supplied to industry today by AEI. These modern units are capable of giving dependable, trouble-free service while withstanding the exacting conditions of arc furnace duty.

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*For further details write to AEI Transformer Division, Rugby, Warwickshire, or to your local AEI Office.*

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MANCHESTER AND RUGBY

E/A903

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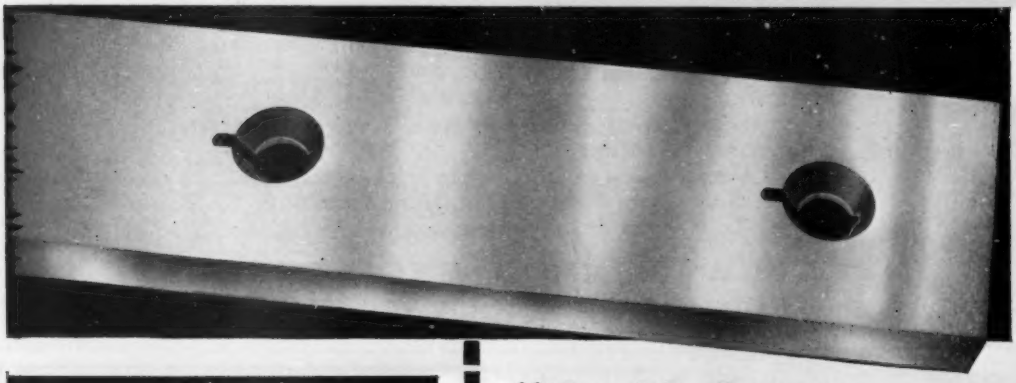

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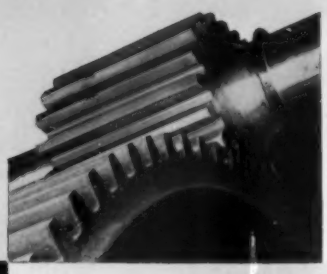

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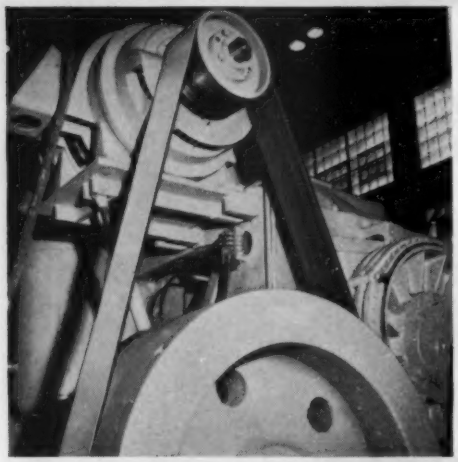

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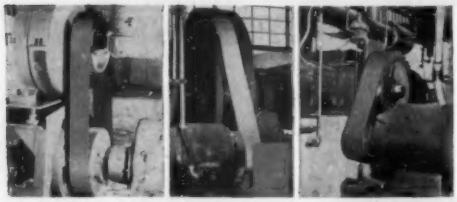

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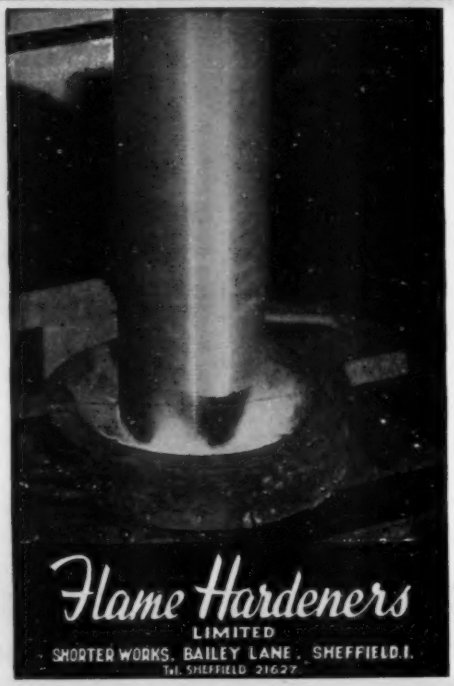

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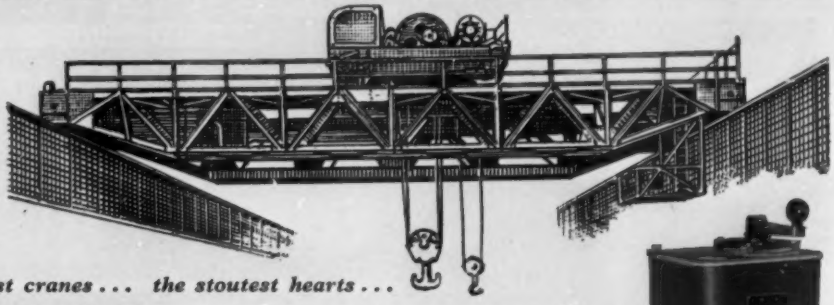

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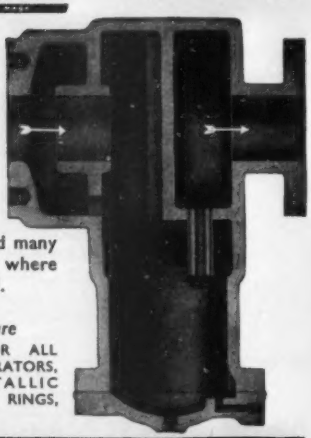

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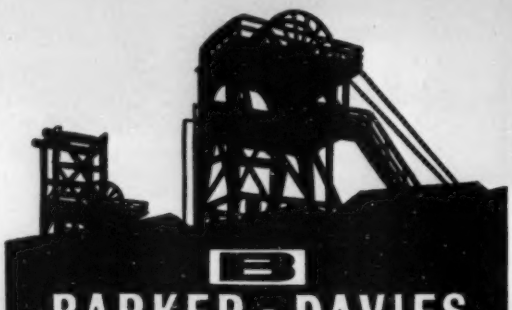

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Fig. 1.

Fig. 2.

Fig 3.

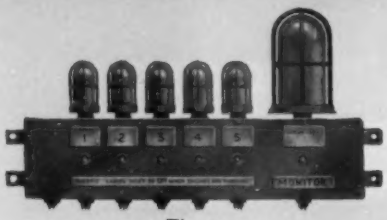


Fig. 4.

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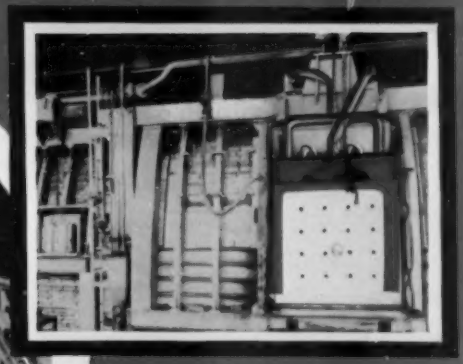

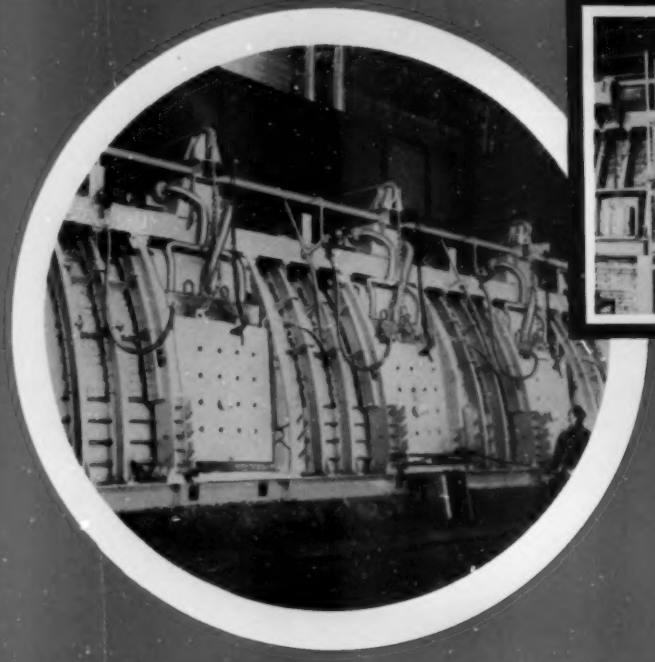

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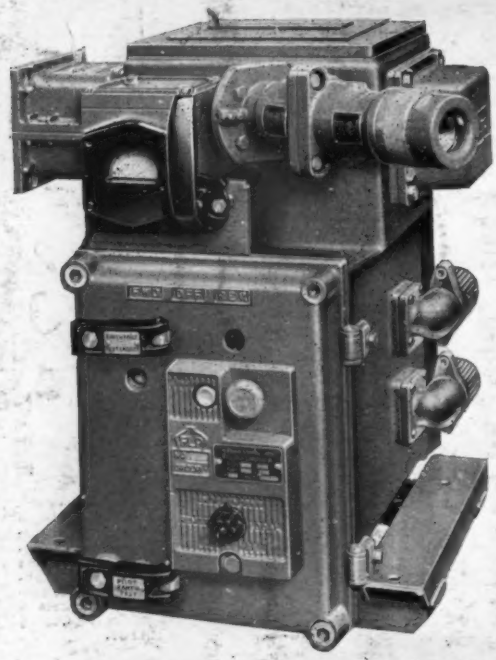

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